Hewlett Packard
Enterprise

HPE Morpheus VM Essentials Software Documentation

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Abstract

User Manual for HPE Morpheus VM Essentials Software version v8.0.10

Published: September 2025

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HPE Morpheus VM Essentials Software

Subtopics

- Getting Started
- Operations
- Provisioning
- Library
- Infrastructure
- Backups
- Tools
- Administration

Getting Started

HPE Morpheus VM Essentials Software is a unified solution allowing for easy deployment of KVM-based HVM workloads and intuitive integration of existing VMware vCenter Clouds, all with administration made easy through the HPE Morpheus VM Essentials Manager. Once deployed, take advantage of powerful features including live migration of VMs across HVM Cluster hosts with zero downtime, dynamically distribute workloads based on load, automatic failover of workloads following the loss of a host, and a lot more. Provisioning new workloads is also made easy with the VM Essentials image library, automation tools, and powerful provisioning wizard. In addition to HVM clusters, VM Essentials also includes a deep integration into VMware vCenter, which also takes advantage of the same powerful provisioning wizard, automation engine, and monitoring capabilities.

This documentation covers the system requirements for HVM clusters and a setup guide for installing VM Essentials manager. It also includes example use cases for effective implementation of the feature set and in-depth sections for each area of the UI detailing the capabilities of each tool.

Before getting started, it's important to note that administrators have the responsibility to install and configure servers and network equipment in a way that will ensure successful operation of VM Essentials. This includes selecting host servers, storage hardware, and networking hardware that have been certified as compatible with the platform. The VM Essentials section of the **HPE Support Center** contains a reference architecture document which includes a validated design with specific hardware SKUs. The same section of the HPE Support Center also includes a qualification matrix which lists hardware that has been certified compatible.

Additionally, administrators will be required to perform some setup functions on their own, such as preinstalling Ubuntu 24.04 (or 22.04 though you won't be able to utilize the latest cluster layouts) on host servers, configuring networking for each host, configuring access to external storage at the OS level, and establishing a network topology that ensures acceptable performance. Subsequent sections of this document will outline some effective network designs and some tips for selecting a network design based on available hardware. It will be the responsibility of the administrator to select a network design based on available hardware and to use the Linux command line to establish appropriate network bonds, storage configuration, and access across the cluster.

Subtopics

- Network Considerations
- Installation
- Initial VM Essentials manager Setup
- Upgrading the Manager
- Compatibility Matrix for HPE Morpheus VM Essentials Software
- Elevating to HPE Morpheus Enterprise

Network Considerations

In order to run VM Essentials effectively in production, network redundancy and throughput must be considered. Network bonding is an important component to building redundancy into the environment so we will briefly discuss it here before showing some example network configurations. Ultimately the environment is your own but this discussion and the example network configurations that follow will help in planning out an effective operating environment for VM Essentials.

NOTE

In the Ubuntu installer, if you configure the IPv4 network, save, and then return to edit it, the gateway and DNS server configurations are no longer present. However, if you continue on with the installation, the configured information does end up in the netplan. This is a known issue with the Ubuntu installer.

Network Bonding

Network bonding is the combining of multiple network adapters into a single logical interface. This is done to build in redundancy and to increase throughput. Network bonds are configured at the operating system level and there are multiple types of network bonds depending on hardware support and other factors.

In the scenarios described in the following sections, we will call out two types of network bonds that are effective for virtualization (active-backup and LACP) and show them in example configurations. VMware LBT bonds are also shown in the table below for the sake of comparison, though only the other two have been utilized in verified scenarios.

Once established, we can later offer up these bonded interfaces as a compute network (for virtual machine traffic) or storage network (for interacting with external storage) when creating our cluster within the VM Essentials manager.

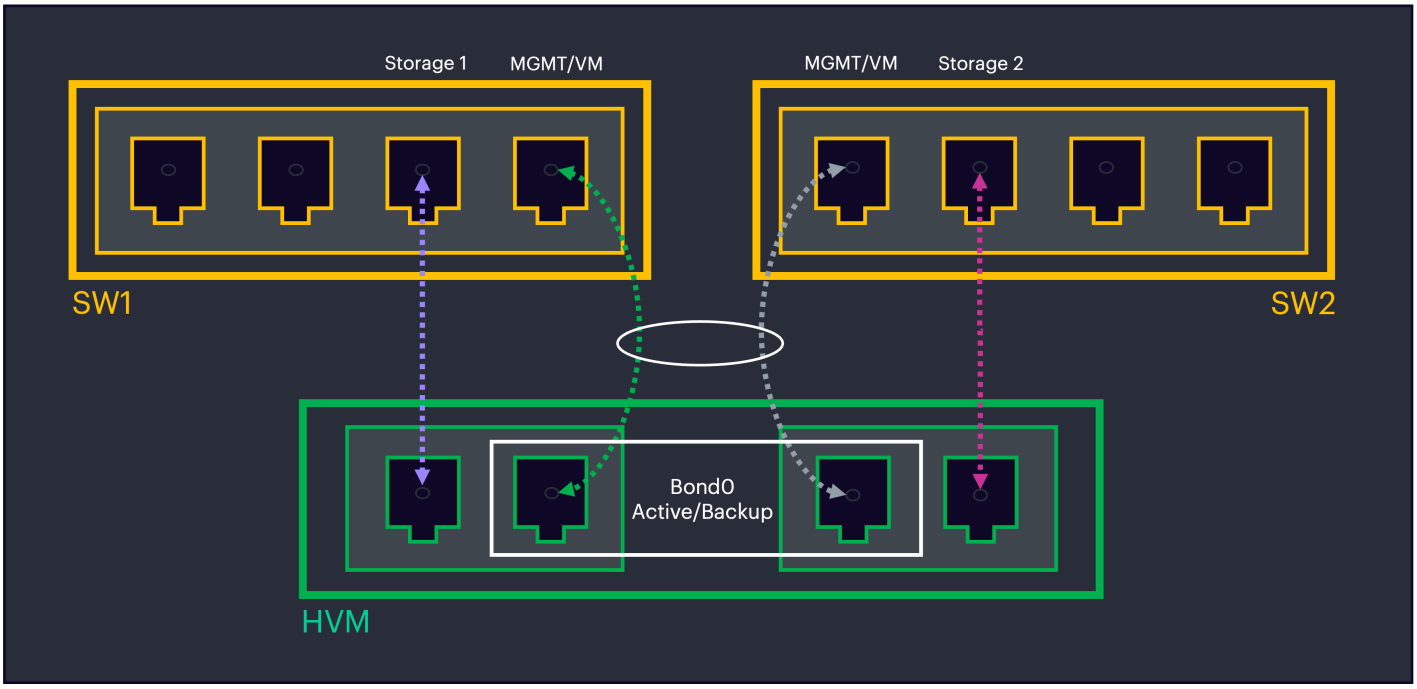
Feature	VMware LBT	Active-backup	802.3ad (LACP)
Switch config required	❌	❌	✅ Yes (LACP Support)
Outbound load balancing	✅ (NIC load based)	❌	✅ (Outbound + Inbound)
Inbound Failover	❌ (Depends on switch)	✅ (Instant failover)	✅ (Switch handles failover)
NIC Utilization	Dynamic	One Active NIC	Full duplex load balancing
Failover Speed	Fast (Outbound only)	Very Fast (link state)	Fast (Switch + Driver)
Complexity	Low	Very low	High (Switch + Host Config)
Best for	Balanced outbound traffic	Simplicity + Resilience	High performance switch-aware setups

Example Network Configurations

If you have the capability to do so, it's recommended you set up networking with full redundancy. Such a setup could include two network switches and hosts with at least six network interfaces spread across two network cards. This would allow for failover in the event of the loss of a switch and/or one of the host network cards in addition to separating management and compute network traffic to their own interfaces. Hosts with only four NICs each can still be configured for full redundancy but would have to converge management and compute traffic across the same interfaces. Keep in mind also that these examples use MPIO (multi-path input/output) for storage. It would also be possible to use bonding for storage depending on capabilities of the environment. MPIO is recommended whenever fibre channel or iSCSI LUNs are being used for GFS2 datastores.

Scenario 1: Recommended Converged Networking Setup

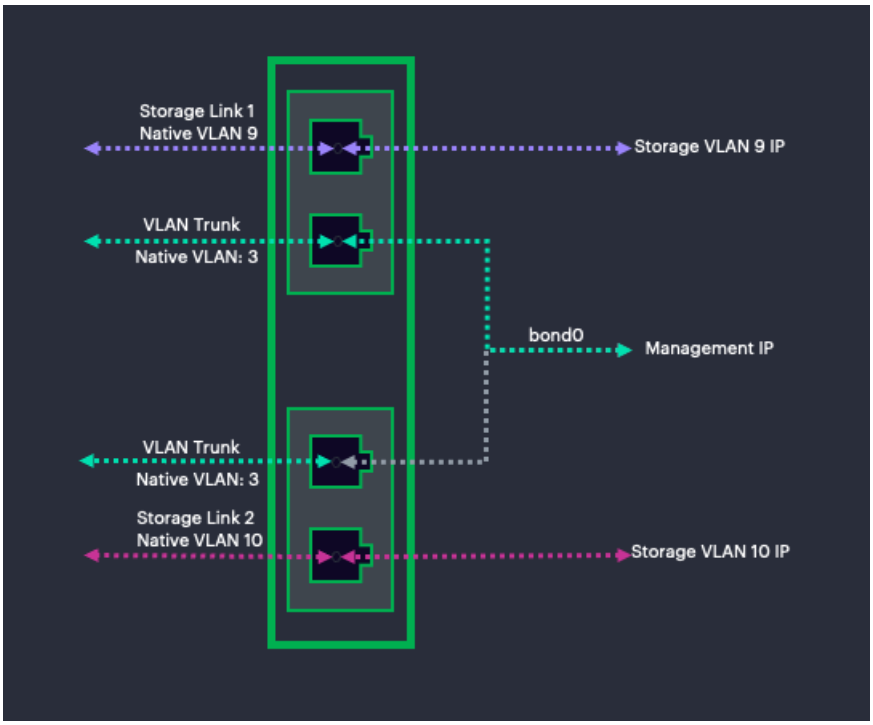
Let's first take a look at two converged networking examples. This is where management and VM traffic is converged over the same bonded interface and storage traffic is independent. In an ideal scenario, you would have at least four network interfaces spread across at least two network cards on the host (shown in green on the diagram below). Ideally you would also have two separate network switches to help ensure resiliency and redundancy. As mentioned in the prior section, these networking examples are all created with resiliency and redundancy in mind. One storage lane is connected to each switch and likewise one management/VM lane is connected to each switch, which are bonded in and active/backup configuration. Consult the bonding table in the prior section for more details on the benefits and drawbacks to different types of network bonds. In this scenario, the bond handles management/VM traffic failover while multipathing handles storage failover. A diagram of such a network setup is shown below:



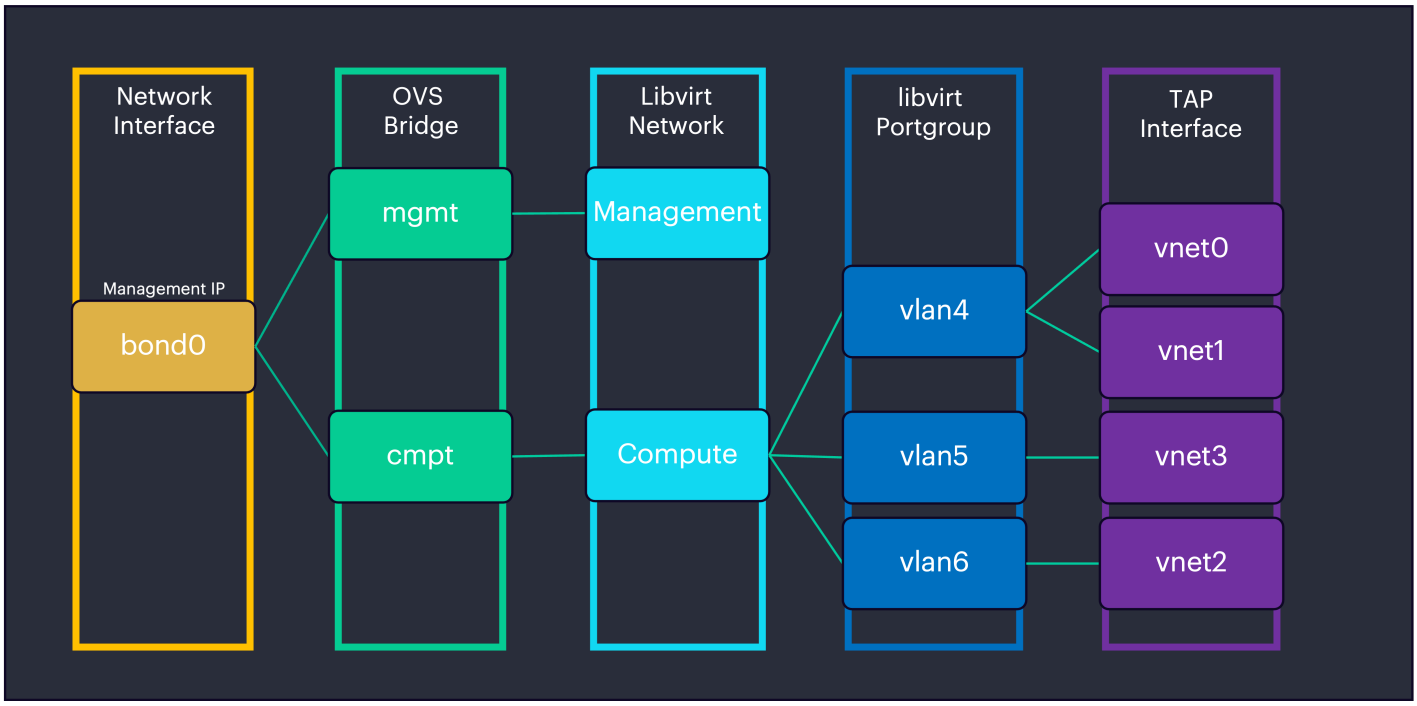
In the example below, we have native VLAN on the trunk ports and on the storage ports. This means the network switch is tagging all the traffic for you and you don't have to tag it yourself. This allows you to put your IP addresses directly on the interfaces and bonds. Here, the storage VLANS get their own IP address directly on the interface while the management IP address goes directly on the bond as shown in the diagram below. With this configuration, all can be done in the installation wizard as long as the VLANs are piped to the interfaces as expected from the network switches. More specific guidance on using the installation wizard is included in later sections covering the software installation.

NOTE

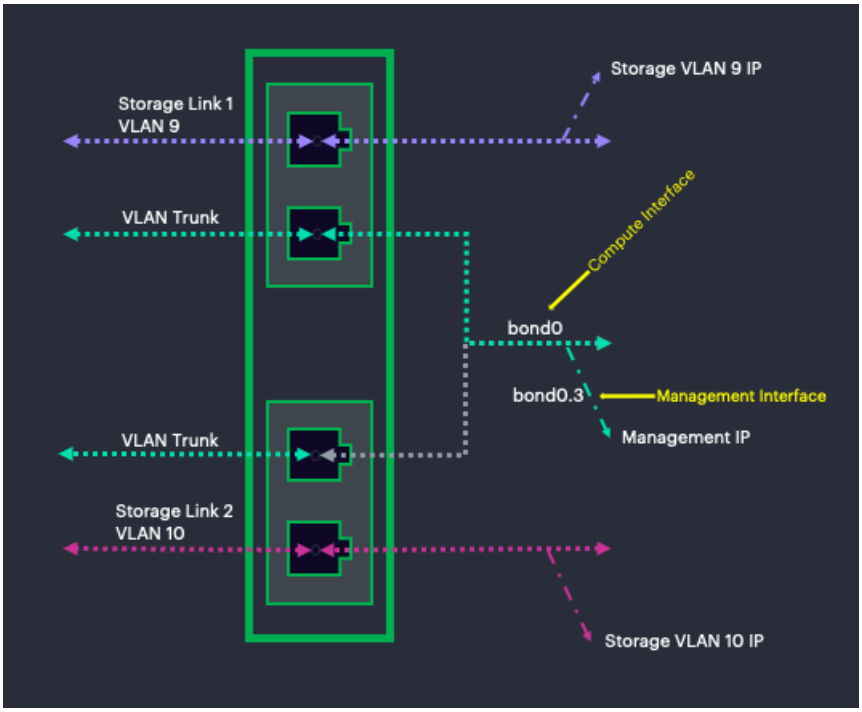
Your environment an configurations will vary. You may or may not have a native VLAN set up for storage traffic as it is best practice to isolate storage traffic when possible. The need for VLAN tagging on specific interfaces is dependent on whether there is a native VLAN on that interface.



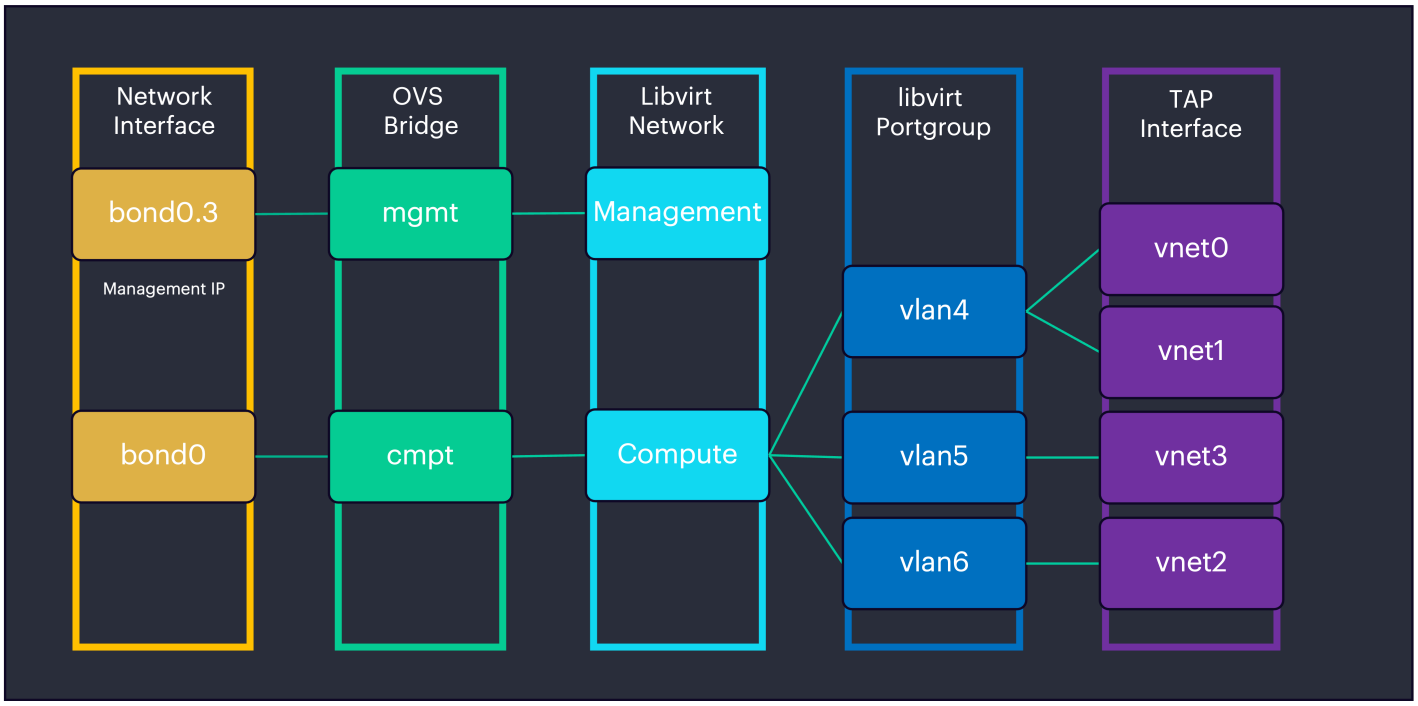
Below is a chart showing the connection from the bonded network interfaces created in the example network configuration above to OVS bridges (a virtual switch that connects VMs to the physical network), Libvirt Networks (logical virtual networks managed by Libvirt), Libvirt Portgroups (subgroups within Libvirt Networks that can expose configurations, such as VLAN tagging), and tap interfaces (the virtual connection that connects the VM to the OVS bridge).



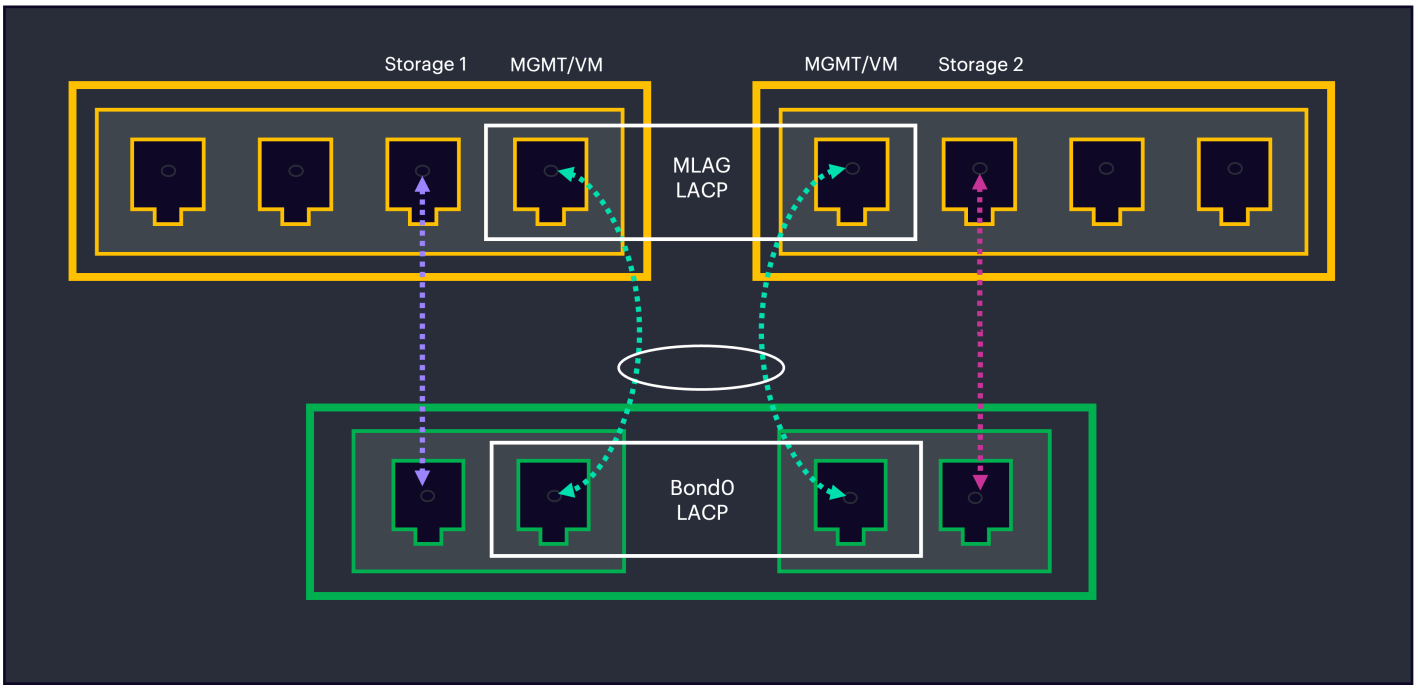
The prior example included native VLANs on the trunk ports and storage ports so we'll now take a look at an example configuration without native VLANs. You need to create VLAN tags on the interfaces because the switch is no longer handling the tagging for you. Your IP addresses then go on those VLAN tags. In this example bond0 becomes the compute interface and bond0.x becomes the management interface when configuring the cluster in a later step. When not using a native VLAN, the storage VLANs still get their own IP address and interface but a VLAN interface gets created on the bond and the management IP address goes on the VLAN interface.



Just as in the similar chart above, the chart below shows the connection from the bonded network interfaces created in the example network configuration above to OVS bridges (a virtual switch that connects VMs to the physical network), Libvirt Networks (logical virtual networks managed by Libvirt), Libvirt Portgroups (subgroups within Libvirt Networks that can expose configurations, such as VLAN tagging), and tap interfaces (the virtual connection that connects the VM to the OVS bridge).

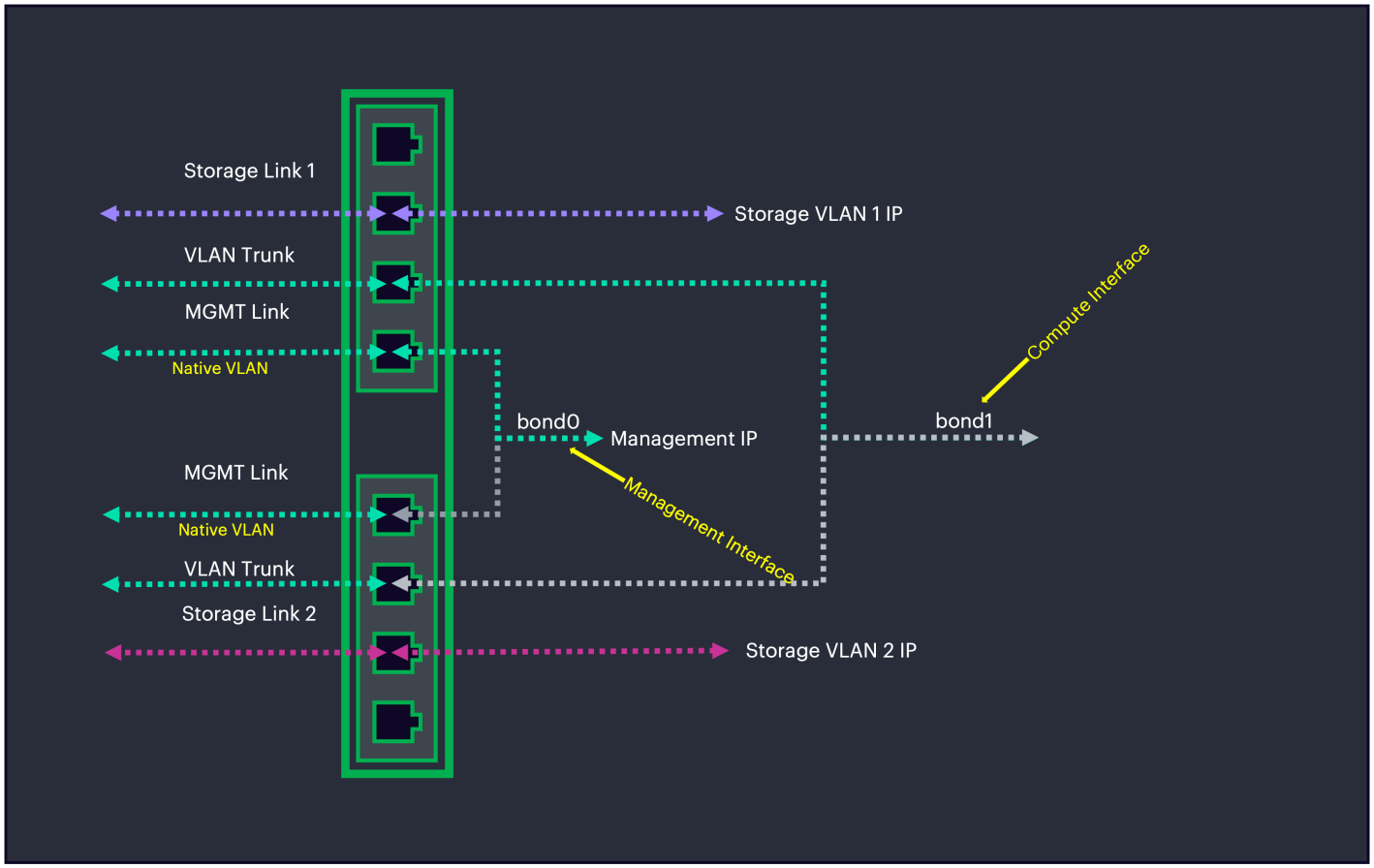


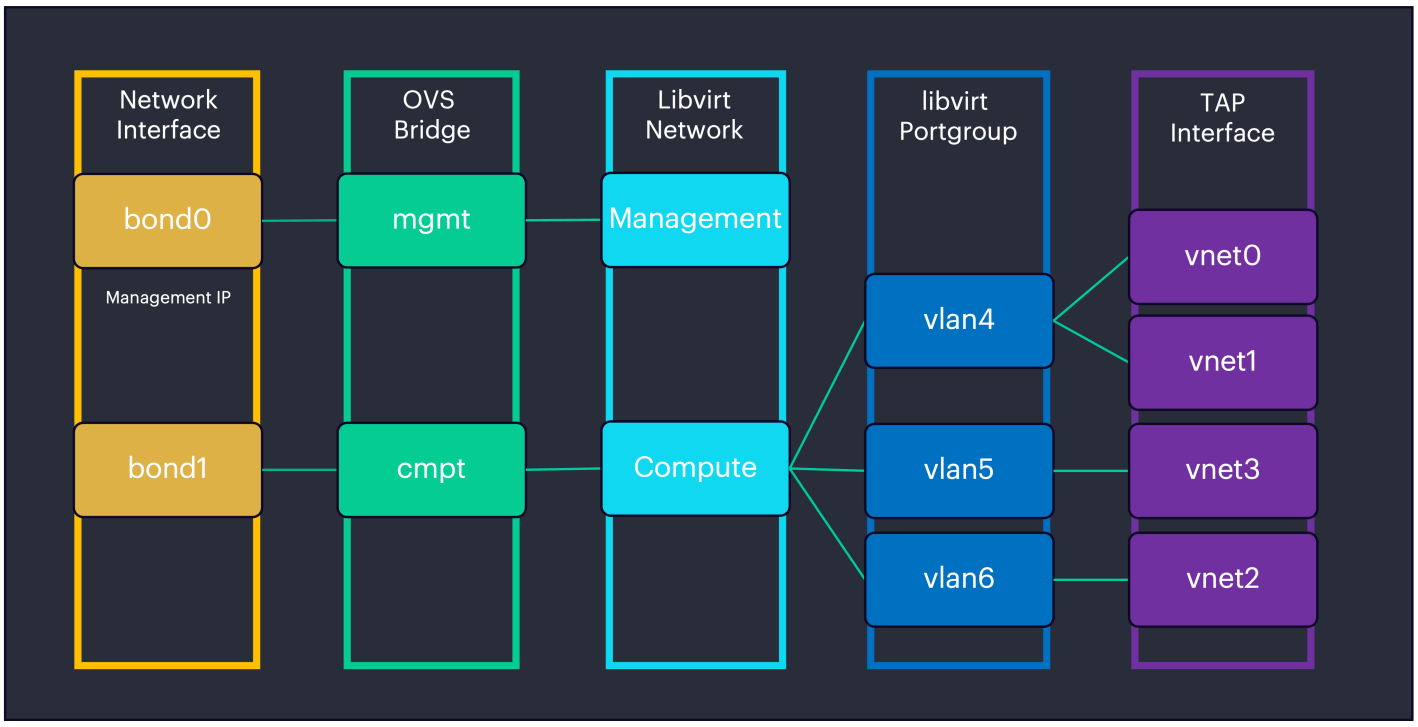
The same networking setup can be used with an LACP bond, however this does require extra configuration on the network switch side. The exact setup steps would depend on the specific hardware in your environment. The network setup would look something like the example below:



Scenario 2: Recommended Decoupled Networking Setup

When hosts have six or more network interfaces spread across at least two cards, management and VM traffic can be separated for even greater network throughput. The overall configuration is very similar. The storage lanes are still separated as they were previously. In this case, create an additional bond across two of the interfaces for VM traffic. As previously, a bond is also created for management traffic. In this example, these bonds are created in an active/passive configuration.





Installation

Having completed a discussion of networking considerations in the previous section, let's now turn to OS installation on the HVM hosts. The hosts are recommended to be HPE Proliant physical servers or other compatible server types (see the **compatibility matrix** for a list of recommended compute server choices) and must be running Ubuntu 24.04 to utilize the latest cluster layout (HVM hosts running Ubuntu

22.04 may also be used but are only compatible with HVM cluster layout version 1.1). For base OS installation on HVM Hosts, Hewlett Packard Enterprise provides an HVM OS Install ISO in My HPE Software Center. This is a pre-patched Ubuntu 24.04 minimal ISO with `kvm` and `hpe-vm` (which is the installation GUI tool) pre-installed.

TIP

Utilizing the HVM OS Install ISO to install the base HVM Host operating system is especially useful for disconnected sites (dark sites) without access to the Internet. This ISO contains Ubuntu 24.04 minimal pre-patched and including required `kvm` and `hpe-vm` packages. When these packages are not present, the installer will attempt to download them from the Internet, which may not be available in all environments. By installing HVM OS, you will only need to provide a few assets from My HPE Software Center to your HVM Hosts and will not need Internet access to pull down other required packages.

The HVM hypervisor runs on top of the Ubuntu hosts. We'll get to the installation portion in the next section but for now we will discuss the system requirements and recommendations for network and storage configuration during the installation.

NOTE

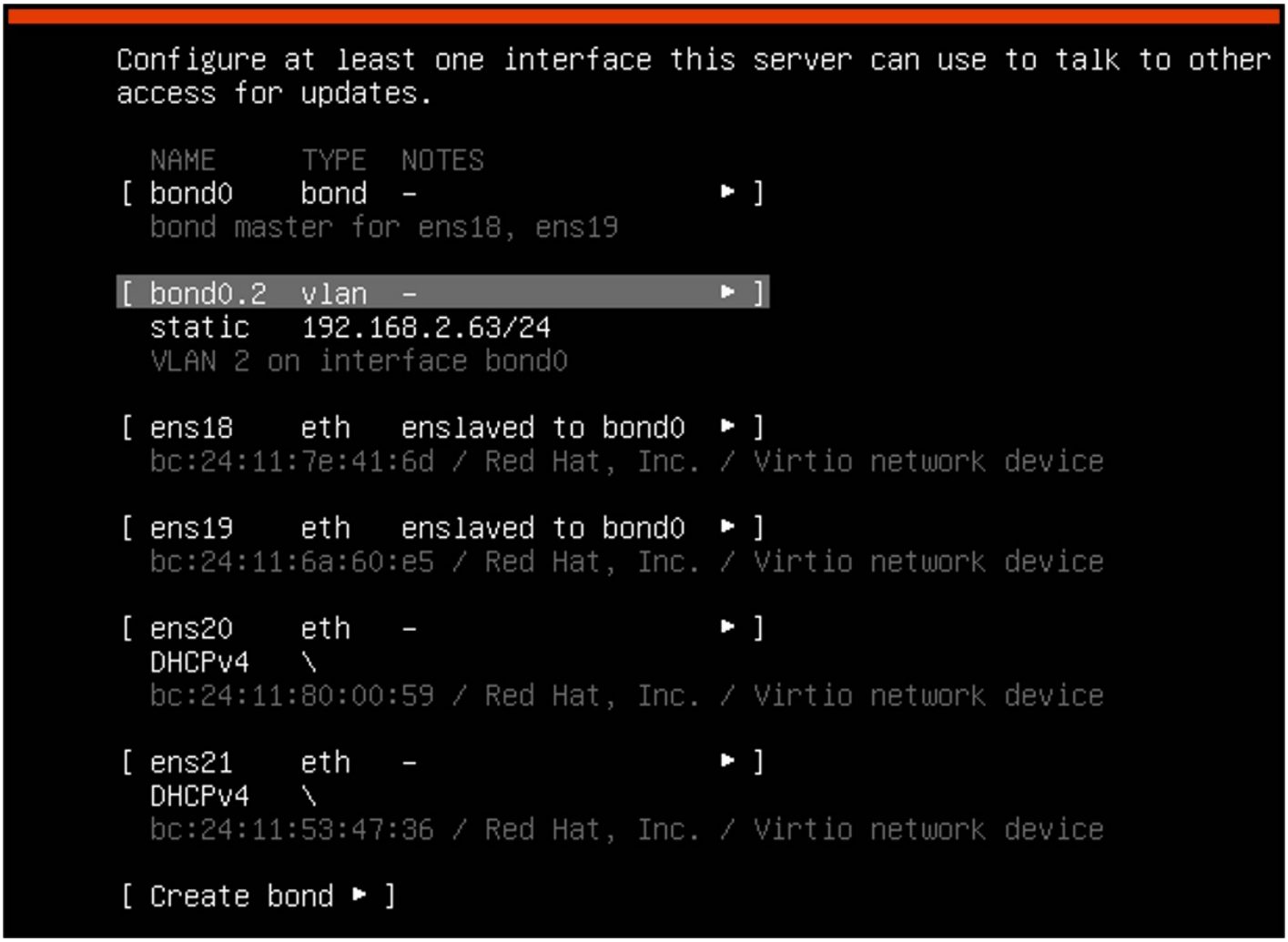
CEPH is not supported in Morpheus 8.0.10 or higher.

Host Requirements

- **Operating System:** Ubuntu 24.04 to utilize the latest HVM cluster layout. Hewlett Packard Enterprise provides a base OS install ISO as a download in My HPE Software Center (HVM OS Install ISO). This is a pre-patched Ubuntu 24.04 minimal ISO with `kvm` and `hpe-vm` (which is the installation GUI tool) pre-installed.
- **Hardware:** HPE Proliant server hardware or another compatible server type is recommended (see the **compatibility matrix** for a list of recommended compute server choices). This list is continually expanded as additional hardware SKUs are tested and verified.
- **CPU:** One or more 64-bit x86 CPUs, 1.5 GHz minimum with Intel VT or AMD-V enabled
- **Memory:** Minimum of 8GB for non-hyperconverged (HCI) deployments or 8GB plus 4GB for each data disk for HCI deployments
- **Storage:** Minimum of 50GB for operating system storage
- **Network:** 100 Mbps or faster NIC (10 Gbps recommended)
- **IP Addressing:** Static IP address
- **Internet Connectivity:** Internet access is required to download and install the required packages and dependencies

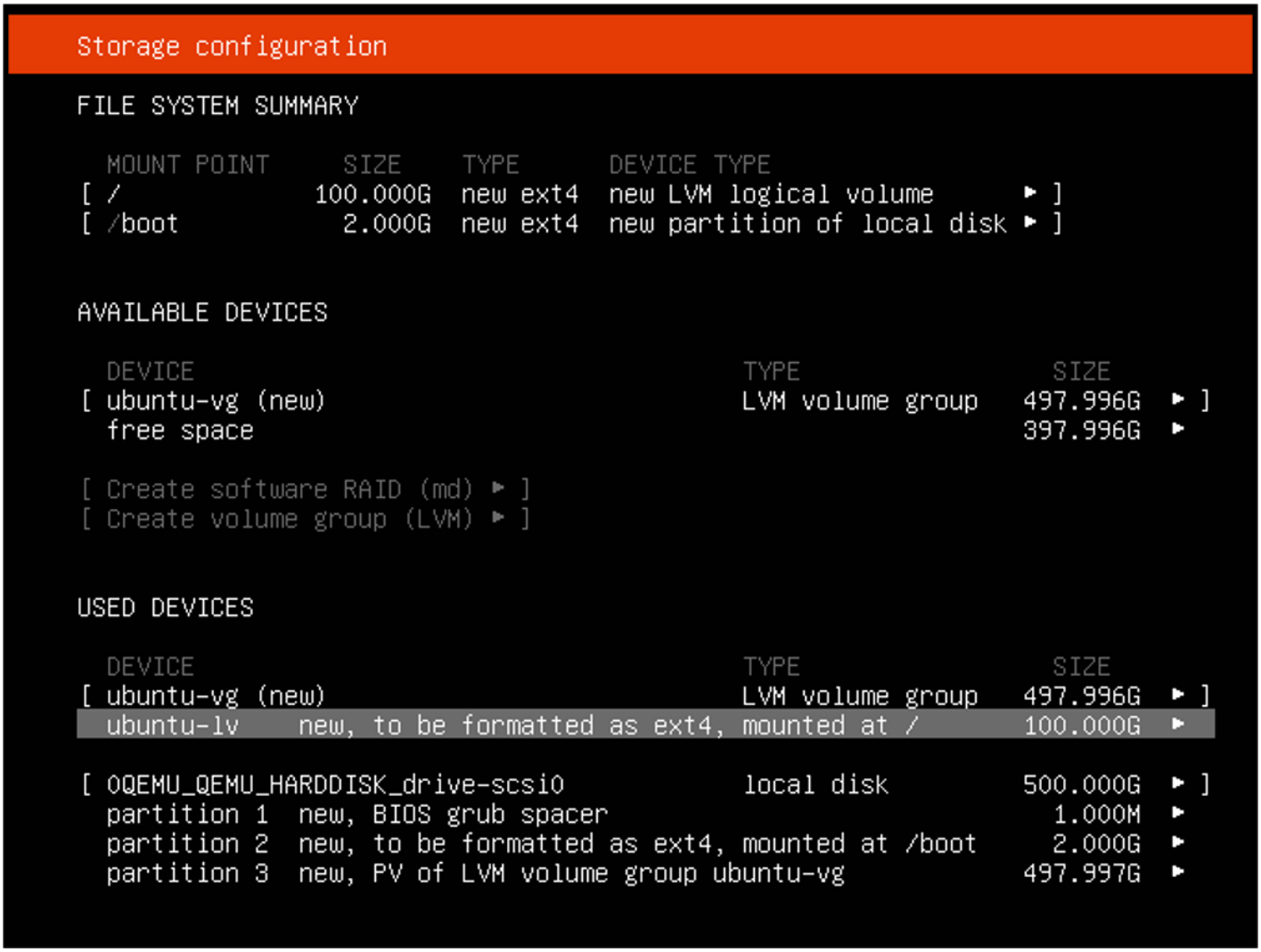
Ubuntu Network Setup

During the networking setup portion of the OS installation, with some network configurations you might have to create the initial bond for the management network in order to get initial connectivity. Bonds can be created from the Ubuntu deployment wizard itself and a discussion of different bond types and their potential usefulness within an effective VM Essentials networking scheme is described in greater detail in the previous section. In the screenshot below, the host is using a converged management and compute interface bond. The bond was created and a VLAN added to the bond. After creating the VLAN, an IP address was assigned at which the individual host can be managed. Thus, when setting up the cluster later, we can identify the `bond0.2` interface for host management traffic and `bond0` as the interface to send all compute traffic. Of course, this is a specific caveat that may not apply such as if you're not using converged networking (described in the previous section) or if DHCP is configured.


Configure at least one interface this server can use to talk to other
access for updates.
NAME TYPE NOTES
[bond0 bond - ▸]
bond master for ens18, ens19
[bond0.2 vlan - ▸]
static 192.168.2.63/24
VLAN 2 on interface bond0
[ens18 eth enslaved to bond0 ▸]
bc:24:11:7e:41:6d / Red Hat, Inc. / Virtio network device
[ens19 eth enslaved to bond0 ▸]
bc:24:11:6a:60:e5 / Red Hat, Inc. / Virtio network device
[ens20 eth - ▸]
DHCPv4 \
bc:24:11:80:00:59 / Red Hat, Inc. / Virtio network device
[ens21 eth - ▸]
DHCPv4 \
bc:24:11:53:47:36 / Red Hat, Inc. / Virtio network device
[Create bond ▸]

Ubuntu Storage Setup

During the storage setup portion of the OS installation, keep in mind that the entire disk won't be utilized by default when using LVM. You'll need to grow the disk. This guide won't discuss that process in complete detail but there are plenty of guides available on the Internet if they are needed.


Storage configuration
FILE SYSTEM SUMMARY
MOUNT POINT SIZE TYPE DEVICE TYPE
[/ 100.000G new ext4 new LVM logical volume ▸]
[/boot 2.000G new ext4 new partition of local disk ▸]
AVAILABLE DEVICES
DEVICE TYPE SIZE
[ubuntu-vg (new) LVM volume group 497.996G ▸]
free space 397.996G ▸
[Create software RAID (md) ▸]
[Create volume group (LVM) ▸]
USED DEVICES
DEVICE TYPE SIZE
[ubuntu-vg (new) LVM volume group 497.996G ▸]
ubuntu-lv new, to be formatted as ext4, mounted at / 100.000G ▸
[QEMU_QEMU_HARDDISK_drive-scsi0 local disk 500.000G ▸]
partition 1 new, BIOS grub spacer 1.000M ▸
partition 2 new, to be formatted as ext4, mounted at /boot 2.000G ▸
partition 3 new, PV of LVM volume group ubuntu-vg 497.997G ▸

External Storage Setup

Though it is possible to utilize local storage on the hosts, more commonly HVM clusters will be configured to interface with external storage. Currently, connecting to external storage over iSCSI and Fibre Channel is supported, see **the compatibility matrix** for a current list of vetted hardware and protocols. External storage provides a number of redundancy capabilities that aren't realized through local storage, such as automatic failover when a host is lost and migrating workloads to new hosts with zero downtime.

Configuring connections to external storage must be done on each host at the OS level. This is part of preparing the hosts for installation of the VM Essentials console and manager. This is done by going to the Ubuntu command line on each host and configuring the initiator to talk to the target. Once this is done and the disk is presented up to the OS, the groundwork is laid for configuring the datastore within VM Essentials manager. This process of creating a new datastore within the Manager UI is shown later in this guide following installation.

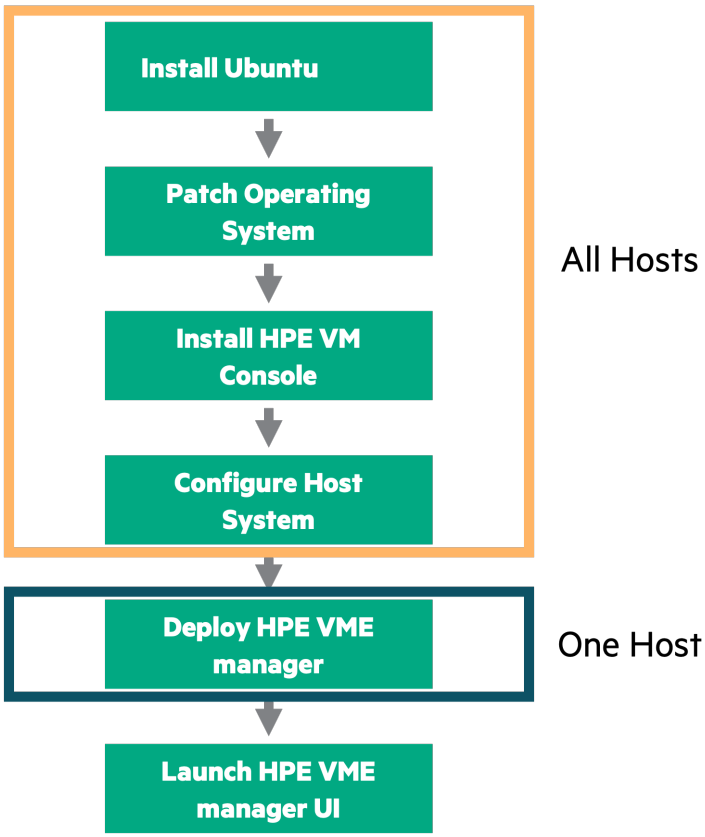
How the storage traffic is routed will depend on networking configuration. Having dedicated storage interfaces, as shown in the network examples from the previous section, is important for optimal throughput and resiliency. After establishing the datastore in the VM Essentials manager UI, this will ensure the operating system is utilizing those dedicated routes rather than through other interfaces that might be available.

Console Installation and Configuration

It's time to begin the actual installation process on the hosts. From a high level, the process is as follows:

- Install using the HVM OS Install ISO (This is recommended over a base Ubuntu 24.04 installation as it comes pre-patched and pre-installed with required `kvm` and `hpe-vm` packages. This is especially ideal for dark sites without Internet access as the required packages are already installed. If a base Ubuntu 24.04 installation is used, the `hpe-vm` installation GUI used to set up the initial cluster will attempt to install the required packages from the Internet). Ubuntu 24.04 is required to use the latest HVM Cluster layouts
- Patch Ubuntu 24.04 with the latest updates and security fixes (especially if using a base Ubuntu 24.04 OS install rather than the provided HVM OS Install ISO)

- Install VM Essentials Console (not required if the HVM Hosts are initially installed from HVM OS Install ISO rather than a vanilla Ubuntu installer). This is a light Debian package that is used to configure the hosts and bootstrap initial virtualization capabilities. This is done on all hosts
- Configure the host system for networking, storage, NTP, etc
- Deploy the VM Essentials manager using the VM Essentials Console. This is done on only one host
- Launch the VM Essentials manager UI and apply license. Note that a short-term evaluation license will automatically be applied for testing purposes if a permanent license is not immediately available

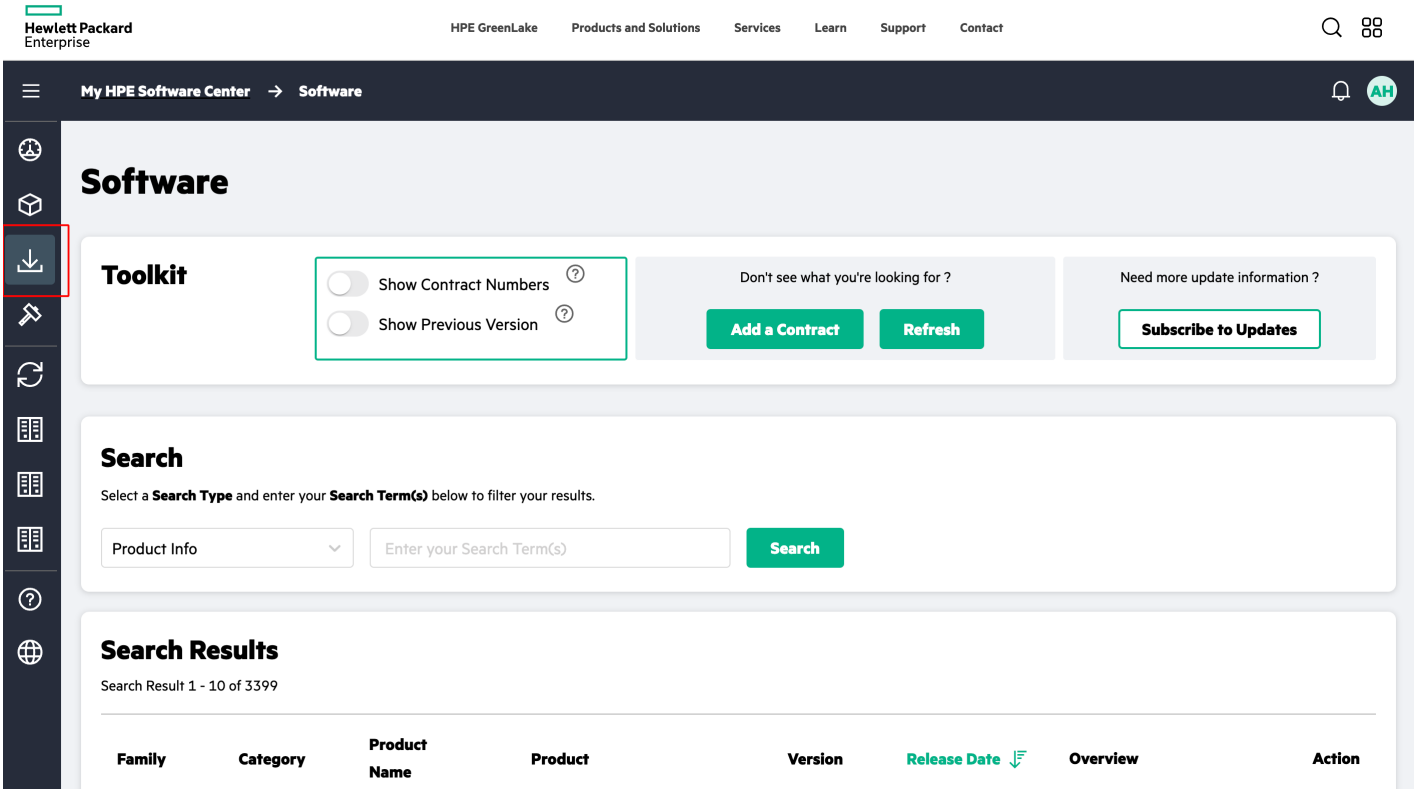


IMPORTANT

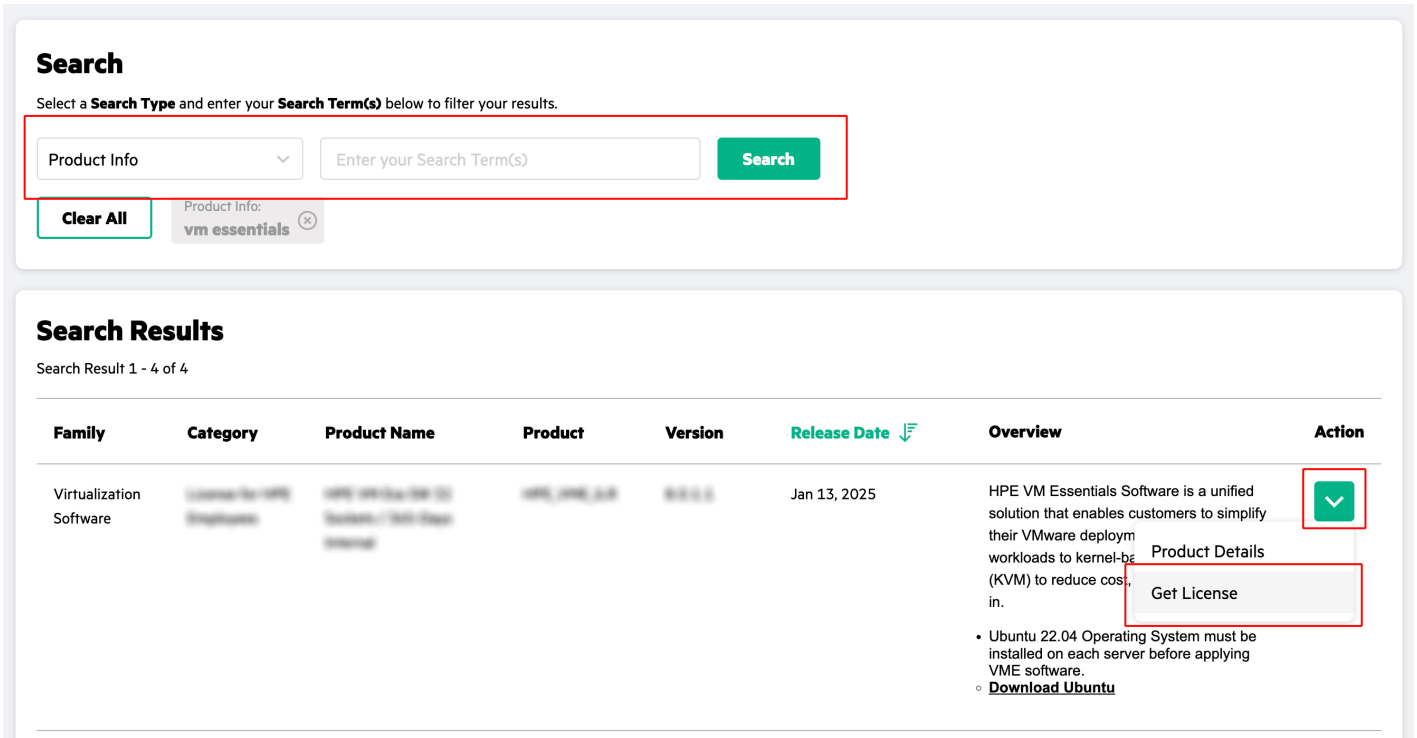
For those establishing clusters running Ubuntu 22.04, compatibility with GFS2 datastores requires hardware enablement (HWE) packages to be installed. This is a set of software components that enables users to run a longterm support version of Ubuntu yet still use newer hardware that might not be supported by the default kernel. Run `sudo apt install linux-generic-hwe-22.04` to install HWE packages. Some HVM Cluster layouts are compatible with Ubuntu 22.04 and these layouts are still supported but the latest ones are not.

Begin the installation process in My HPE Software Center. You'll eventually need to either get a license for HPE Morpheus VM Essentials Software or you'll need to access software entitlements in My HPE Software Center for a pre-existing license. If you don't have a permanent license available immediately on installation, a short-term evaluation license will be applied for testing purposes. A permanent license may be applied at any time after installation. The screenshots below describe the process for requesting a license but this may not be necessary if you already have one. Consult with your account manager if you have any questions.

Once logged into My HPE Software Center, click on the “Software” section from the side navigation.



Within the “Software” section, search for HPE Morpheus VM Essentials Software amongst your other software entitlements. A “Product Info” type search for the term “HPE Morpheus VM Essentials Software” may work but depending on the entitlements present in the account and future changes to search functionality, a slightly different search might be required. Once VM Essentials is successfully returned, click on the dropdown menu under “Action” and click on “Get License.”



From the download page, you'll see software packages, open source packages, and license files. For a fresh installation, you'll need both the HVM OS Install ISO and the HPE VM Essentials SW Image ISO. The HPE VM Essentials SW Image ISO contains a QCOW2 image containing the VM Essentials Manager. This ISO also contains a small Debian package which is required only if installing from vanilla Ubuntu rather than from the provided HVM OS. Mark the box next to any files you wish to download and then click “Download.” You do not need the separate debian packages offered outside of the `.iso` image as those are only for upgrading a pre-installed VM Essentials manager.

HPE_VM_Essentials_8.0.8_HVM_Installer_2404_S5Q83-11030.iso (4.29 GB)
SHA256 Checksum: d4299a5dd1fb60c708f83fc8febf17a5041e85417f04b7b12a... (Copy)
Signature File: S5Q83-11030.iso.sig

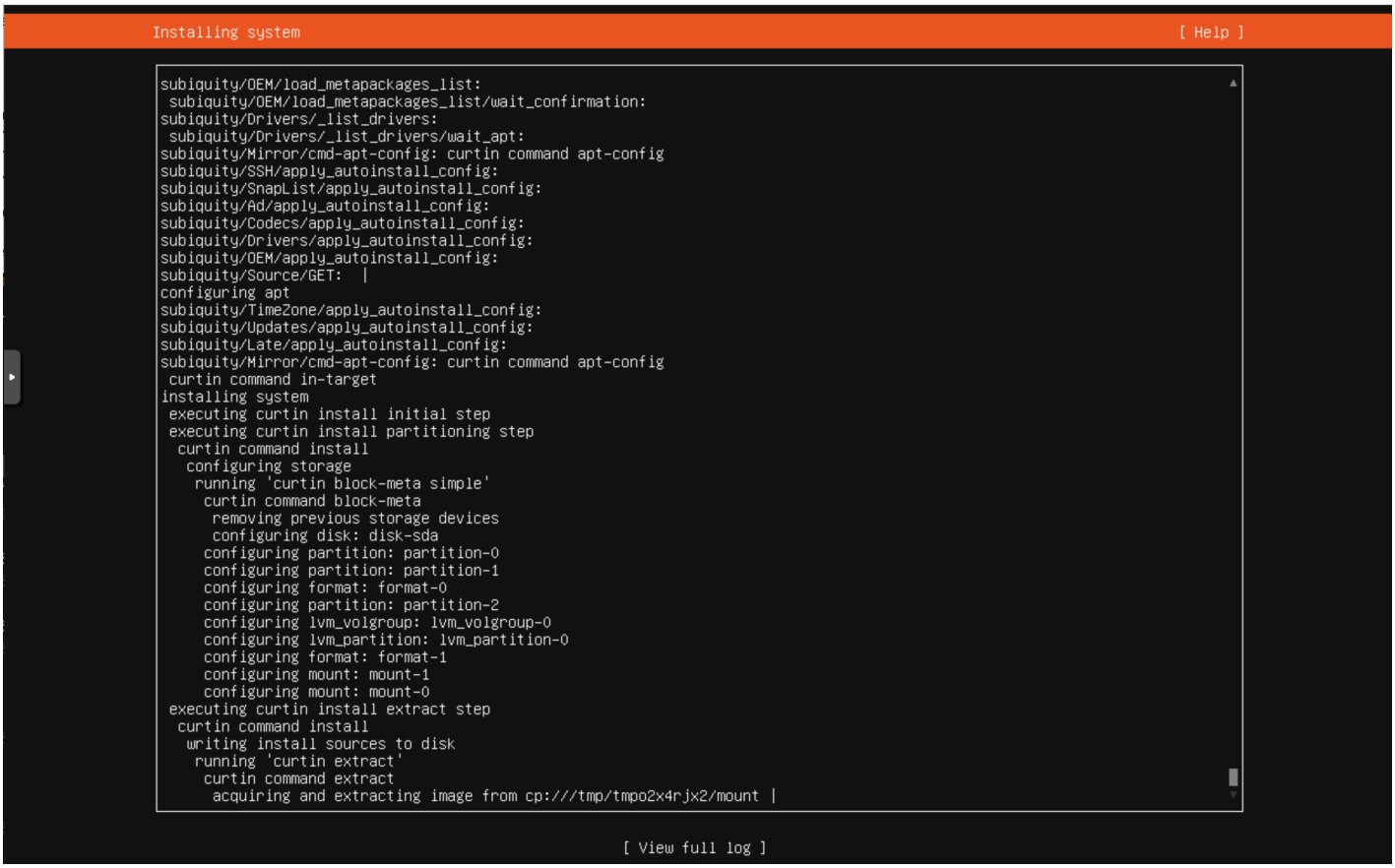
Your download speed may be affected by your internet service provider (ISP). Download curl Copy

NOTE
Some commands listed in this installation guide will require superuser privileges.

We'll install HVM on all host nodes first. Mount the HVM OS Install ISO to a DVD Drive device on the host machine and boot from it. Once successfully booted, select the option to install HVM OS.

GNU GRUB version 2.12
*HVM Install 24.04
Ubuntu Server with the HWE kernel
Test memory
Use the ↑ and ↓ keys to select which entry is highlighted.
Press enter to boot the selected OS, `e' to edit the commands
before booting or `c' for a command-line.
The highlighted entry will be executed automatically in 5s.

Proceed through the installer keeping in mind the Ubuntu network settings, Ubuntu storage settings, and external storage recommendations given in earlier sections of this install guide. Once details are entered for the initial account creation, proceed through the installation and reboot each host.



> **IMPORTANT**
>
> Tight time sync is vital for successful operation of an HVM Cluster. Take a moment to configure NTP server settings on each host. See **this knowledge article** for specific steps on configuring NTP for HVM Hosts.

Now that the host system has been installed, ensure the image is up to date by running `apt update -y && apt upgrade -y` as a super user. Now you can mount the HPE VM Essentials SW Image ISO to your computer. The exact process will vary by software platform. On Linux, first select a temporary mount point (such as `/mnt/iso`) or create a temporary mount point if it doesn't exist (`sudo mkdir /mnt/iso`). Next, mount the ISO to your temporary mount point (`sudo mount -o loop /path/to/file.iso /mnt/iso`). Take stock of the files by changing into the proper directory (`cd /mnt/iso`) and listing them out (`ls`).

Now that the files contained in the ISO are accessible, copy the QCOW over to one of the hosts. This will be the host that runs the HVM Manager VM. If you've installed vanilla Ubuntu, you will also need to copy over the `hpe-vm` Debian package to all hosts (though this is not necessary if you've installed HVM OS). On Linux, this could be done with `scp` (`scp /path/to/file.qcow2 username@hpevmhost_hostname_or_ip:/path/to/desired/location/`) but the copy process will be slightly different for other operating system platforms.

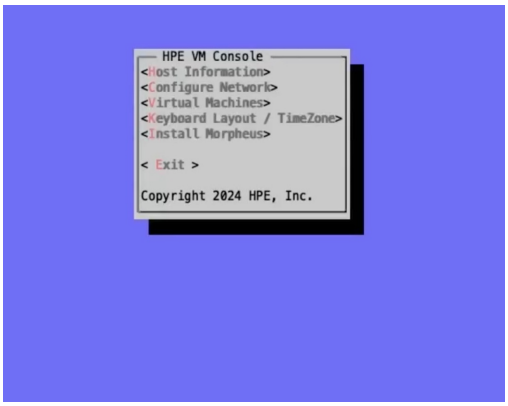
If necessary, go ahead and install the `hpe-vm` Debian package with `apt install -f hpe-vm.deb`. The "-f" option indicates that a file will be installed. Note that the Debian file name listed here is an example placeholder and the name of your downloaded file will likely be different. When asked if you wish to install all of the packages provided, confirm that you do and then wait for installation to complete. This process is installing on the host all of the packages needed to be part of a virtualization server, including KVM, Libvirt, and more. HVM OS includes these packages preinstalled so this installation step is unnecessary if you installed HVM OS rather than vanilla Ubuntu.

> **IMPORTANT**
>
> The rest of this section describes the configuration process within the console for a specific network configuration. Your network configuration may be different and certainly interfaces and VLANs will be differently named. This is meant to illustrate the tools that are available within the console for performing various networking configurations. You may or may not need all of these steps and the specific configurations within these steps may be different in your environment.

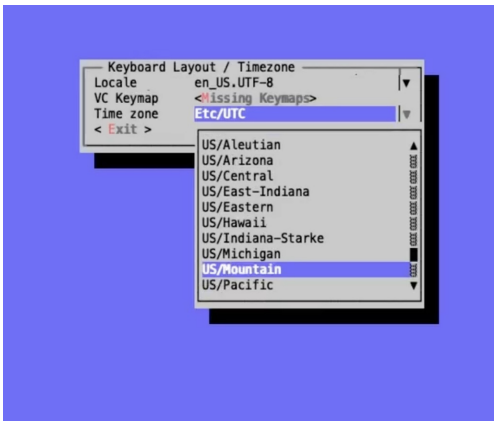
With that, HVM OS and the VM Essentials console installation is complete. Enter the console with the following command: `hpe-vm`.

NOTE

Some versions of the installer also include an option to install the VME worker. The VME worker is meant for sites where direct SSH communication between the HVM hosts and the VM Essentials manager is not possible. It is a feature of HPE Morpheus Enterprise Software and SimpliVity, it is not compatible with HPE Morpheus VM Essentials Software. More information on distributed workers is available in **HPE Morpheus Enterprise documentation**.



First, enter the section for keyboard layouts and timezones. Set the time and make any changes to the keyboard layout, if needed.

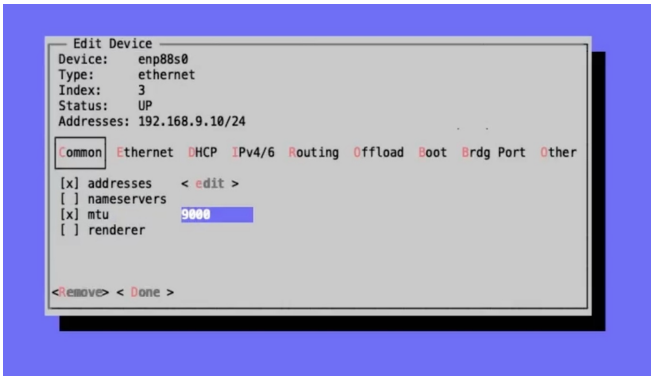


Next, enter the section for network configuration. The first thing that I'm going to do is set the MTU for relevant interfaces to 9000 (jumbo frames). This has a number of benefits including improved efficiency, reduced latency, and optimization for storage networks. Open the "Device Type" dropdown and choose "vlan". In my example case, there's one VLAN which is the "bond0.2" VLAN shown in a prior section. Once selected, mark the box next to "mtu" and enter "9000" in the resulting box. Then, save changes.

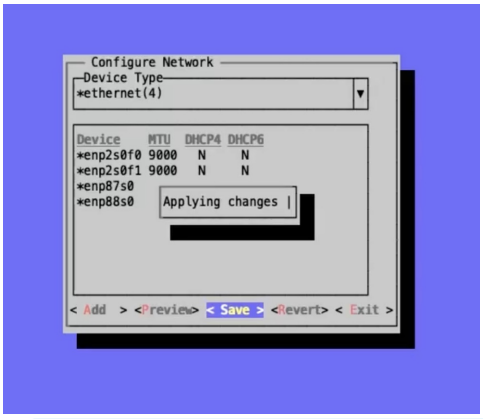
Next, use the "Device Type" dropdown to once again select "ethernet" which you saw earlier before switching into the "vlan" section. Using the same process, I will also set the MTU to 9000 on both ethernet devices that make up my bond as well as on the bond itself. To get to the bond, you'd access the bond section from the "Device Type" dropdown in the same way that VLANs and ethernets were accessed. Now that I've set MTU of 9000 across the board, I'll go back to the ethernets section to work with my other two devices (the storage interfaces).

I'll continue this example by opening each of the two storage interfaces in turn. Three configurations I'll point out here are "addresses", "nameservers", and "mtu". In this case, I'll mark the box for "addresses" and provide an address in the pop-up modal that appears. I don't need to make any other configurations within that modal (lifetime, etc). A nameserver is not needed because the storage network are isolated and don't need to route out anywhere. Finally, I'm marking the box for "mtu" and setting the value at 9000 as I have with other interfaces. Next, tab over the DHCP section and disable DHCP for this interface. Save the changes and repeat the process for the other

storage interface.



Once all of the necessary networking configurations are made, you'll want to save all changes. This will cause the changes to be applied and take us back to the main screen where we first accessed the timezone section and the networking configuration section. The console will show you that changes are being applied and will respond with a confirmation if they are successful.



IMPORTANT

In an earlier section, we discussed network bond types, one of which was active/backup. If using active/backup bonds, it's important to note that a default MII polling setting is not applied out of the box. This means failover won't work correctly without configuring it yourself. Take a look at **this knowledge article** for specific steps to configure this in `netplan` and the `hpe-vm` console.

At this point, I am done configuring my example interfaces through the VM Essentials console. It does have some additional functionality not shown here which may be needed depending on your specific network configuration. Make sure to complete this process on all hosts before moving on to the next section which covers the installation of VM Essentials manager onto one of the prepared HVM hosts.

Manager Installation

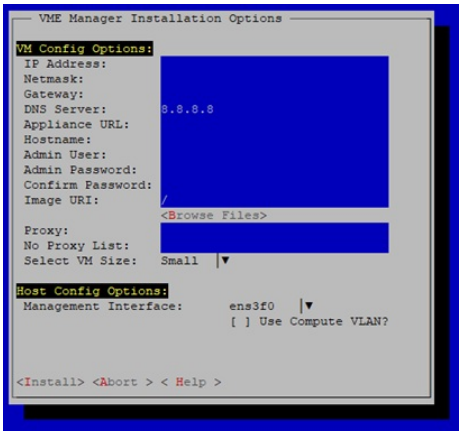
Having configured the HVM hosts through the VM Essentials Console in the prior step, we'll now install VM Essentials manager. Unlike the console, the manager is only installed on one of the hosts and serves as the control plane for the server in addition to providing a provisioning engine, automation functionality, monitoring, secrets management, and a lot more. Before starting, make sure you've already downloaded the QCOW image for the manager and are aware of its full path on the host you've chosen to work from. In fact, it may be beneficial in the next step to go ahead and copy the full path into your paste buffer. The image is available in the HPE software center. Contact your account representative if you are unable to download it using the steps in the previous section.

Before you begin, the following information should be readily at hand:

- IP address to give to the VM Essentials manager
- URL for the web server
- DNS resolution for the URL (points the URL to the manager IP address)
- VLAN the manager should be deployed on
- Management interface name
- Compute interface name

To install the manager, select "Exit" if in a configuration modal or use the `hpe-vm` command as superuser and select "Install VME

Manager". Here we are given a modal containing some configuration options required for the VM Essentials manager.



Let's first configure the following fields using the information mentioned previously. You should have available for this step:

- IP Address
- Netmask
- Gateway
- DNS Server
- Appliance URL
- Hostname (same as the appliance URL without the FQDN)

In the "Image URI" field, enter the "Browse Files" option to traverse your filesystem and locate the QCOW2 image. Once found, select the file and then select "Open". The image path will then appear in the "Image URI" field. Alternatively, paste in the path to the manager image.

NOTE

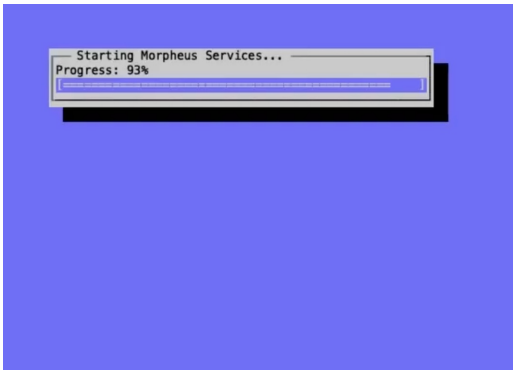
Once a host is initially set up over SSH, communication to the VM Essentials manager is mostly handled through an outbound connection from an agent running on the host to the Manager VM. This makes the Appliance URL configuration very important. This is the HTTPS URL the agent will connect to from within each hypervisor host. The one exception are hypervisor console sessions which still go through SSH.

After filling in those fields, enter a username and password for an SSH user that can be used to get into the manager machine. Following that, if necessary, configure any proxy details.

The final configuration to make here involves specifying the size of the manager machine, either small, medium, or large. Each of the respective sizes consumes the following amount of resources:

- **Small:** 2 vCPUs and 12 GB RAM
- **Medium:** 4 vCPUs and 16 GB RAM
- **Large:** 4 vCPUs and 32 GB RAM

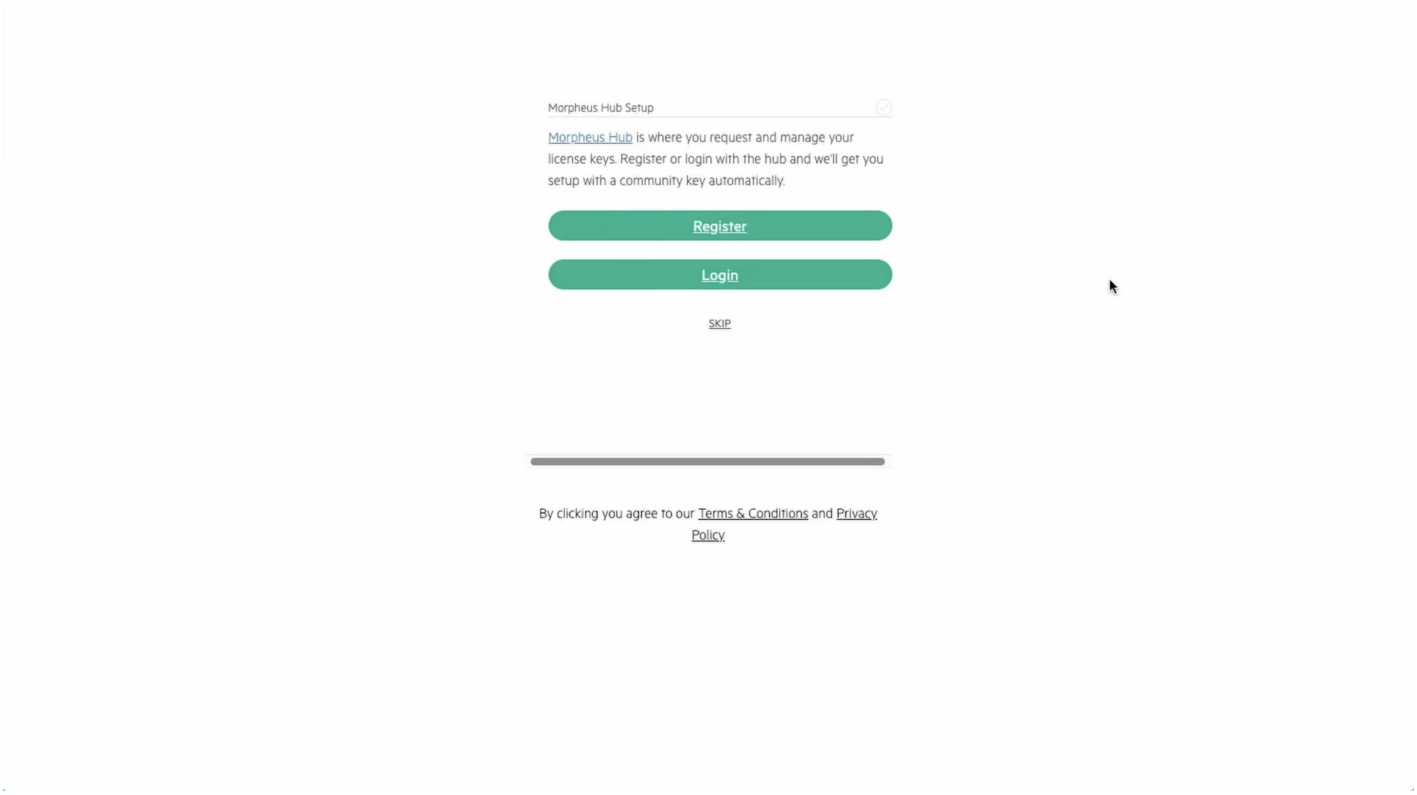
The greater the capacity, the greater amount of resources and cluster sizes the VM Essentials manager can manage. For large production environments, it's recommended you select a large manager. After selecting the size, you'll need to identify the management interface and (if using) the compute interface and compute VLAN tag. Following all of these configurations, select "Install".



At a certain phase in the install process, you'll see a message in the progress bar modal stating "Starting Morpheus Services...". At this point, you can direct a web browser to the appliance URL and see if you can access the appliance. If you get a response returned, even if it's just telling you the appliance is still loading, that's a good sign the web server is installed and things are working. Once all is well, you will arrive at a setup page which leads us into the next section on setting up VM Essentials manager.

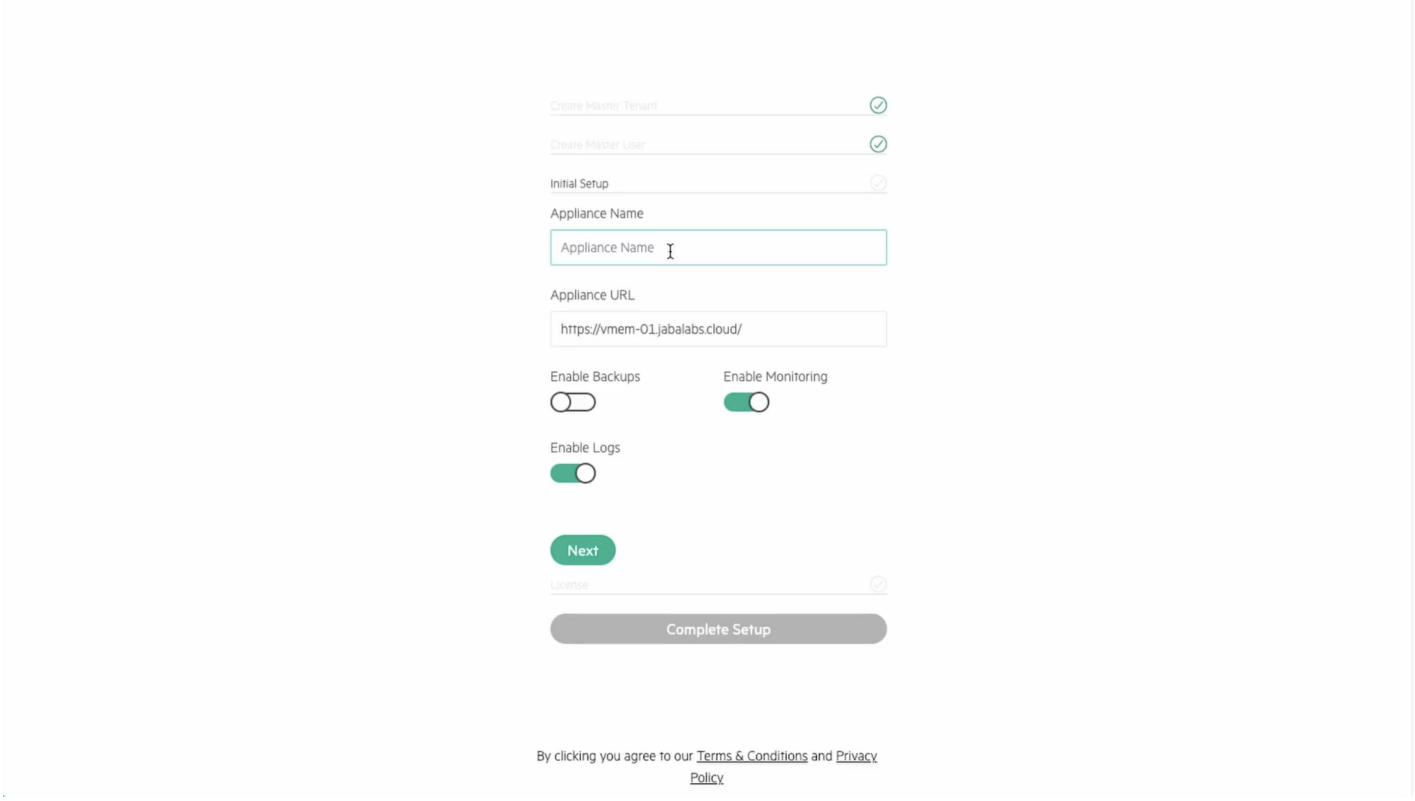
Manager Initialization

With VM Essentials manager up and running, you can now access the UI frontend by pointing your web browser to the appliance URL that you set in a previous step. You should see a registration screen like the one below.


Morpheus Hub Setup
Morpheus Hub is where you request and manage your license keys. Register or login with the hub and we'll get you setup with a community key automatically.
Register
Login
SKIP
By clicking you agree to our Terms & Conditions and Privacy Policy

You'll need a license to go much further with the product. If you've followed this guide up to this point, you should already have your license key downloaded from My HPE Software Center. If not, you can log back in any time an re-download the file containing the license key. If you choose to skip entering a license key at this time, a short-term evaluation license will be applied. This can be upgraded to a full license at any time from the global settings section of the application.

The rest of the process involves naming the account on the manager and entering the details for your initial administrator user. Next, provide a name for the appliance, confirm the appliance URL is correct as entered, and choose from a few global enablements (for backups, monitoring, and logs).



After clicking through to the next section, you will paste in your license key. Click “Complete Setup” and you will be dropped into the UI for the first time. Installation is now complete!

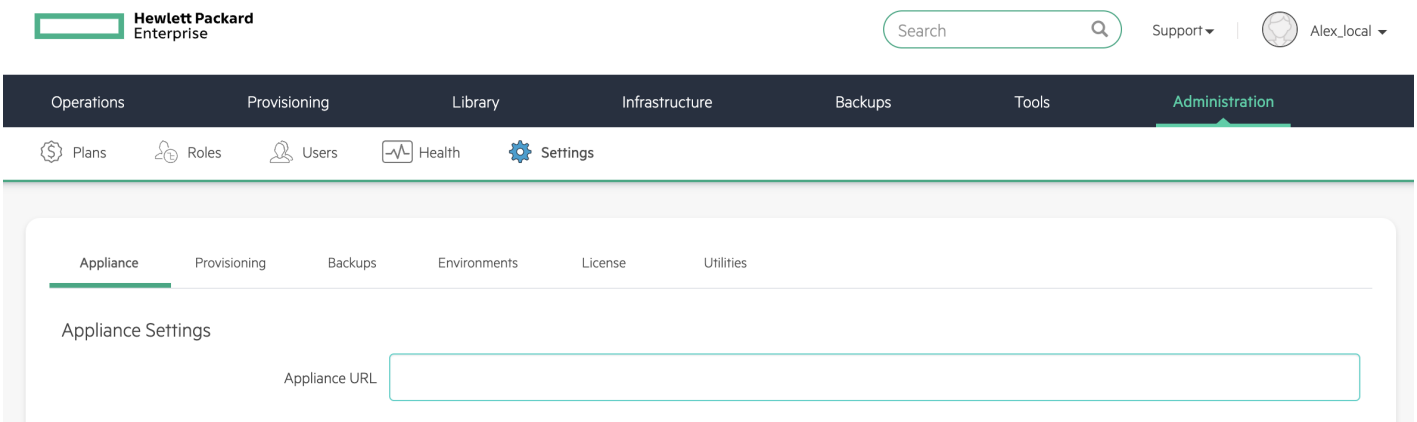
At this point, you are ready to move on to the next section which goes over the initial environmental setup steps that must be undertaken to add the first HVM cluster to the VM Essentials manager.

Initial VM Essentials manager Setup

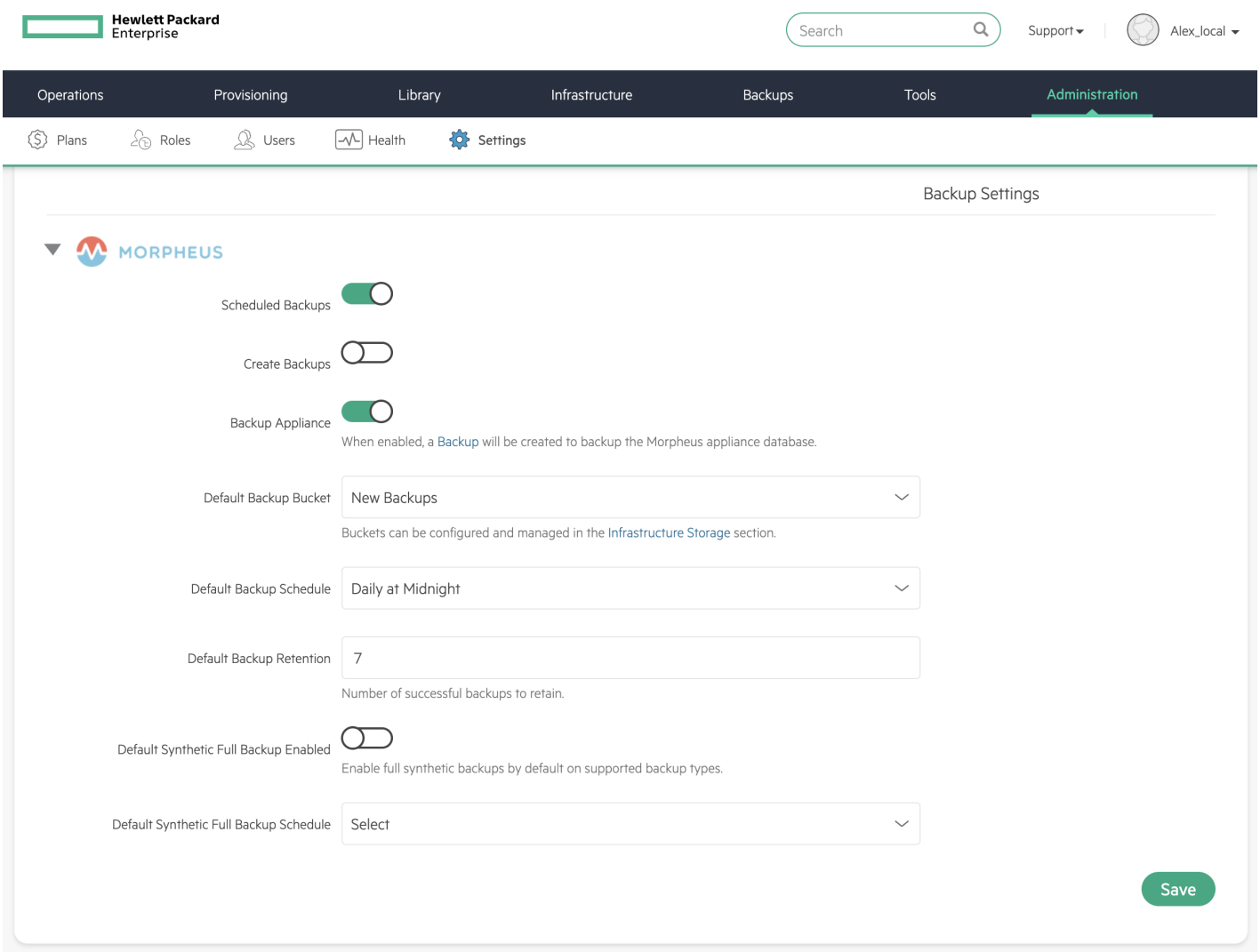
With VM Essentials manager now installed, you’re dropped into the UI and want to get up and running as quickly as possible. This section goes over some useful first steps for configuring the environment, locating useful features, and adding the first HVM cluster.

Global Settings

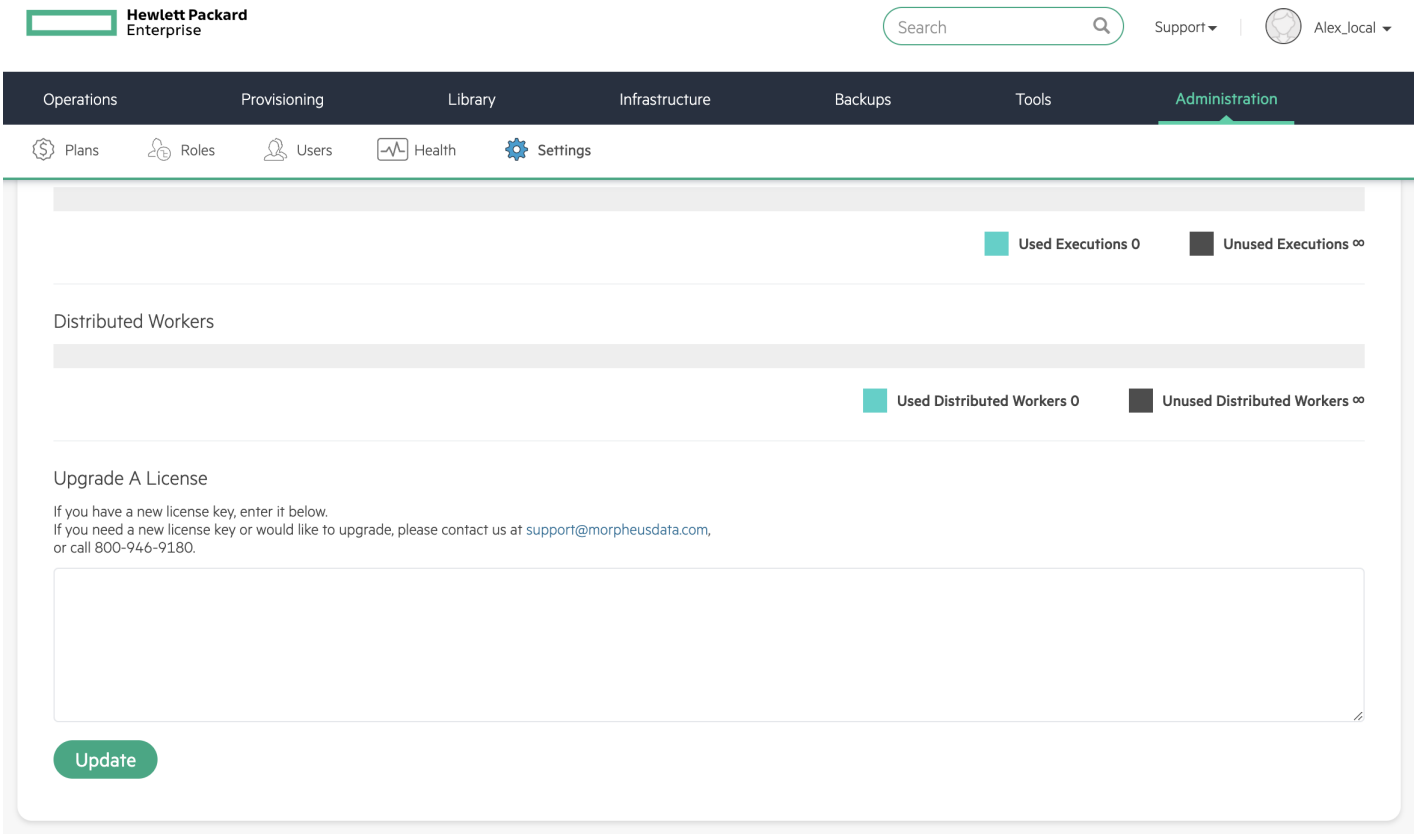
A useful first stop is in global settings (Administration > Settings). Within the Appliance category, check and fill an “Appliance URL” value. This is the default value for VM Essentials Agent installation and functionality. All Instances and hosts must be able to resolve and reach this URL over port 443 for the Agent to install and function properly. Individual Clouds can also have an individual Appliance URL which supersedes the global one set here. While here in the Appliance category, consider checking the “Skip Agent Install” toggle. If on, this toggle will be set by default in the Instance provisioning wizard. If off, this toggle will not be set by default in the Instance provisioning wizard. If your default stance is to install the Agent and maximize the value provided for workloads running on HVM clusters, this toggle should be off.



Next, check the Backups section which houses global settings related to backups. If “Scheduled Backups” is toggled, default automatic backup settings will be pre-set each time you begin to configure a new Instance through the Instance provisioning wizard. These default backups will target the default bucket, schedule, and retention settings you see here. This is a good time to double check your default backup bucket and retention settings as it is possible to backup Instances directly to the VM Essentials manager VM. If you fill the Manager’s disk with backups you could bring the Manager down.



One last area to check is the License section. Here you can check your usage against licensed maximums as well as apply new licenses. If you started the Manager using the built-in trial license you will have to return here at some point to apply a full license.

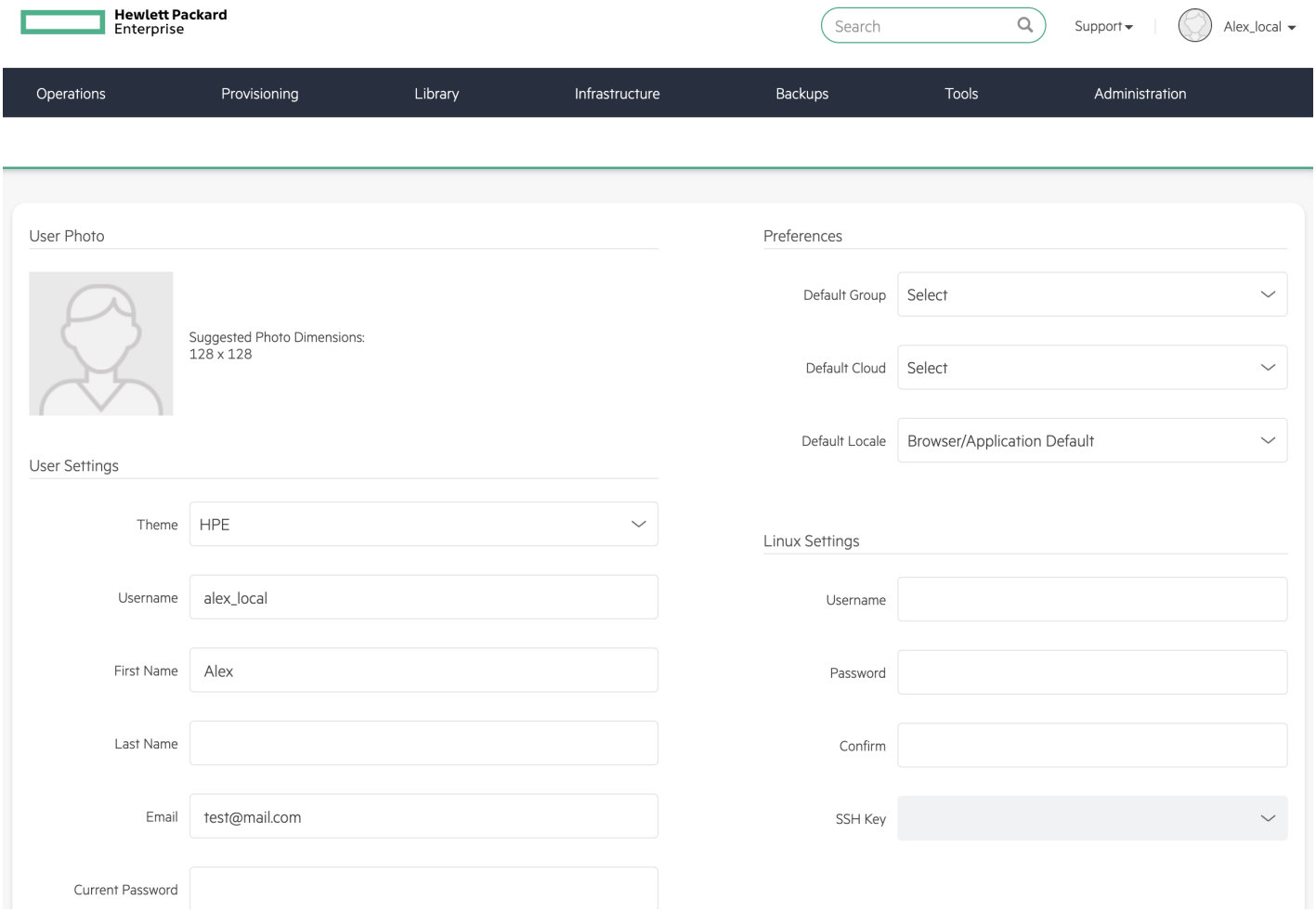


See the **global settings section** of VM Essentials documentation for complete details on settings.

User Settings

Next, check User Settings. User Settings is accessed by clicking the user's name in the upper-right corner of the application window and then clicking "USER SETTINGS".

Some settings you may want here include "Email" which will ensure any automatic email generated by the Manager (such as Instance provisioning success messages) arrives at a place it can be seen. Setting a default Group and Cloud is also useful as new workloads will begin with your most-used Group and Cloud set by default, which will save a lot of clicks over time. If you haven't yet created your first Group and Cloud (covered in a later section), come back later to set that default. Finally, it's useful to configure a Linux and Windows user here. At provision time if you opt for your user to be added to provisioned Instances, a user will be added with your indicated username, password, and public key (if specified, you must have an existing SSH keypair in the Manager) for easy access to any running workload. API access settings and 2FA settings are also here.



Creating Groups and Clouds

You won't be able to add your first HVM cluster without a pre-existing Group and Cloud. Groups define logical groupings of resources and users access those resources based on the Groups associated with their Roles. A Cloud can represent a grouping of HVM clusters or a connection into a VMware vCenter environment. You can read more on Groups and Clouds **here** and **here**, respectively. This guide will go through the process of adding Private Cloud-type Clouds which house HVM clusters. For VMware-type Clouds, see the associated **integration guide**.

Start by making your first Group. Click + CREATE at Infrastructure > Groups. A Group needs only a name, at minimum. If this Group is going to hold some or all of your HVM clusters, you may want to name it accordingly. Once done, save the new Group. We'll next create a Cloud. Navigate to Infrastructure > Clouds and click + ADD. In addition to being a logical grouping for HVM clusters, Clouds can also be a connection into a specific VMware vCenter environment (as narrow as a specific Resource Pool or folder, or more broadly scoped). See the link in the previous paragraph for more details on VMware Clouds. In this case, create a "Private Cloud." Once again, a name is the minimal amount of information required and you may want to name this Cloud in a way that indicates which HVM clusters it will encompass. When done, save the new Cloud.

Creating the first HVM cluster

In preparing the environment, we've already prepped the physical cluster servers but now it's time to provision the actual cluster object within VM Essentials. Begin by navigating to Infrastructure > Clusters and click + ADD CLUSTER. Currently, the only available cluster type is "HVM," which is what we want. Select the correct cluster type and click NEXT. On the Group tab, select the Group we created in the previous section and click NEXT. On the Name tab, select the Cloud we created in the previous section and enter a name for the cluster. Click NEXT.

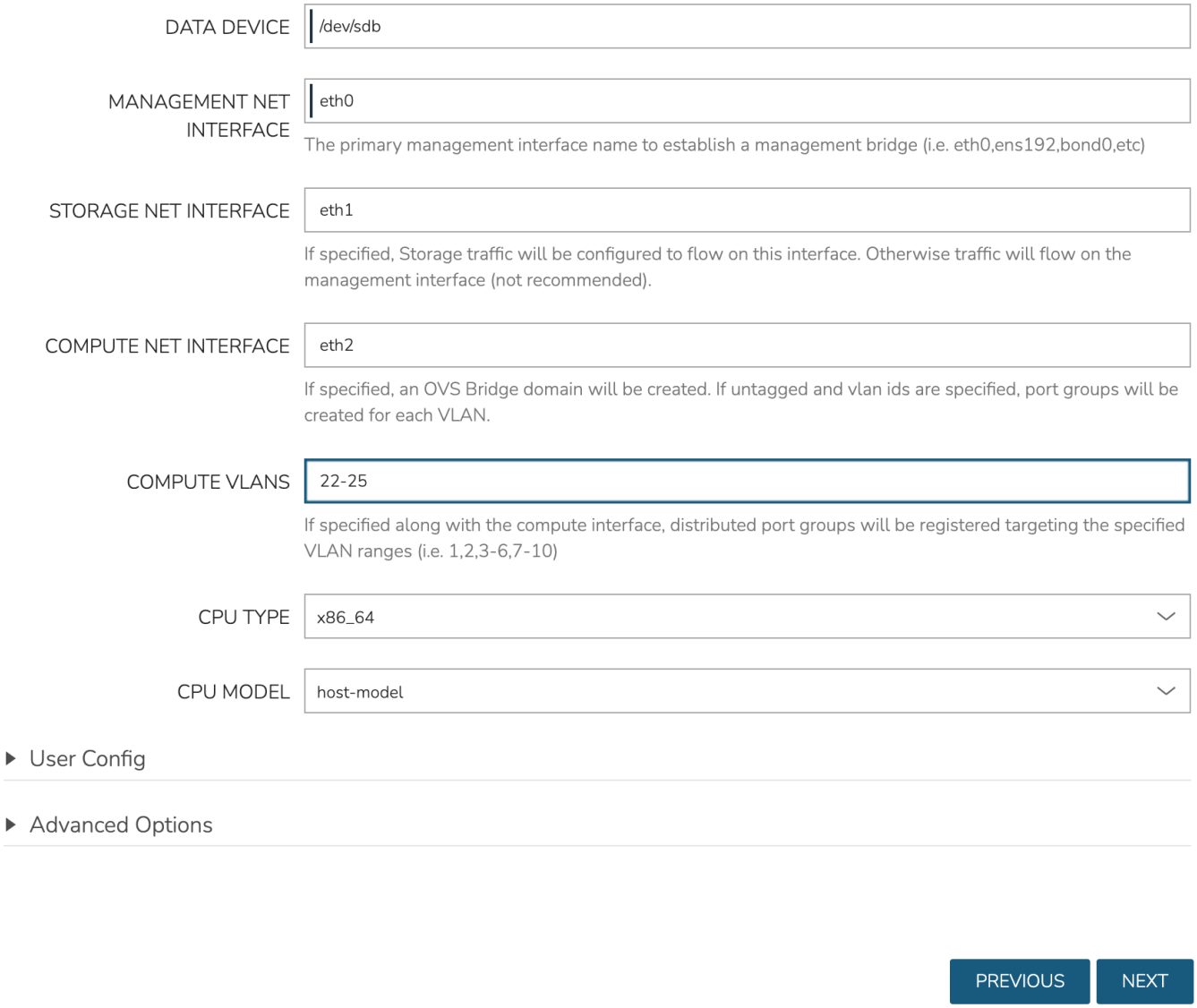
VM Essentials gives the option to select a hyperconverged infrastructure (HCI) **LAYOUT** or non-HCI. In this example, the HCI Layout is used (requires a three-node minimum). Next, configure the names and IP addresses for the host boxes (**SSH HOST**). The SSH HOST name configuration is simply a display name in VM Essentials, it does not need to be a hostname. By default, configuration space is given for three hosts which is what this example cluster will have. You must at least configure one and it's possible to add more by clicking the (+) button. The **SSH PORT** is pre-configured for port 22, change this value if applicable in your environment. Next, set a pre-existing user on the host boxes (**SSH USERNAME** and **SSH PASSWORD**) and **SSH KEY**. Use a regular user with sudo access.

In the next part of the modal, you'll configure the storage devices and network interfaces. When storage initializes, it needs to be pointed to

an initial data device. Configure this in the **DATA DEVICE** field. At this time, only one device may be given but in the near future, an update will allow for multiple devices to be configured which would be added to the total storage as one large volume. Find your disk name, if needed, with the `lsblk` command. In my case, the target device is located at `/dev/sdb`.

Though not strictly required, it's recommended to have separate network interfaces to handle cluster management, storage traffic, and compute. In this example case, `eth0` is configured as the **MANAGEMENT NET INTERFACE** which handles communication between the cluster hosts. `eth1` is configured as the **STORAGE NET INTERFACE** and `eth2` is configured as the **COMPUTE NET INTERFACE**. The **COMPUTE VLANS** field can take a single value (ex. 1) or a range of values (ex. 22-25). This will create OVS port group(s) selectable as networks when provisioning workloads to the cluster. If needed, you can find your network interface names with the `ip a` command.

Finally, only one **CPU TYPE** is currently supported (`x86_64`) though this may change in the future. For **CPU MODEL** configuration, we surface the entire database of model configurations from `libvirt`. If unsure or if you don't know of a specific reason to choose one or the other, select `host-passthrough` which is the default option.


DATA DEVICE
/dev/sdb
MANAGEMENT NET INTERFACE
eth0
The primary management interface name to establish a management bridge (i.e. eth0,ens192,bond0,etc)
STORAGE NET INTERFACE
eth1
If specified, Storage traffic will be configured to flow on this interface. Otherwise traffic will flow on the management interface (not recommended).
COMPUTE NET INTERFACE
eth2
If specified, an OVS Bridge domain will be created. If untagged and vlan ids are specified, port groups will be created for each VLAN.
COMPUTE VLANS
22-25
If specified along with the compute interface, distributed port groups will be registered targeting the specified VLAN ranges (i.e. 1,2,3-6,7-10)
CPU TYPE
x86_64
CPU MODEL
host-model
User Config
Advanced Options
PREVIOUS
NEXT

At this point we've kicked off the process for configuring the cluster nodes. Drill into the Cluster detail page and click on the History tab. Here we can monitor the progress of configuring the cluster. VM Essentials will run scripts to install KVM, install OVS, and to prepare the cluster. In just a short time, the cluster provisioning should complete and the cluster will be ready to deploy workloads.

For more on cluster provisioning, monitoring clusters, and provisioning workloads to existing clusters, see the full section on HVM Clusters.

Take Note of Virtual Images and Automation

Now that we have a cluster, let's take a quick look at where Virtual Images live and where Automation scripts can be created and stored. Both are under the Library menu. In the Virtual Images section is a list of all Virtual Images that have been synced from integrated Clouds (such as a VMware vCenter Cloud) or manually uploaded. Additionally, running workloads (such as VMs running on HVM clusters) can be saved as images with one click. Once the image has been taken, it will appear in the list of Virtual Images here. When provisioning, a list of all compatible images for the target Cloud type is shown. You will need to have at least one HVM-compatible image here in order to provision new Instances to the cluster. When uploading images manually, there's often some additional configuration that must be done to make the

image compatible with the intended target Cloud type. Take a look at **Virtual Images** documentation for more detail.

Next in the Library section is Automation. This page contains a list of automation scripts that are stored in VM Essentials. These scripts can be shell scripts, Powershell scripts, or a restart Task that restarts workloads it's run against. I won't go into full detail on writing scripts and the nuances of how they can be used in this section but there's more in the full **Tasks section** of VM Essentials documentation. Tasks can be used on the Automation tab of the Instance provisioning wizard. Stack Tasks and chain the results for fully automated Instance deployment.

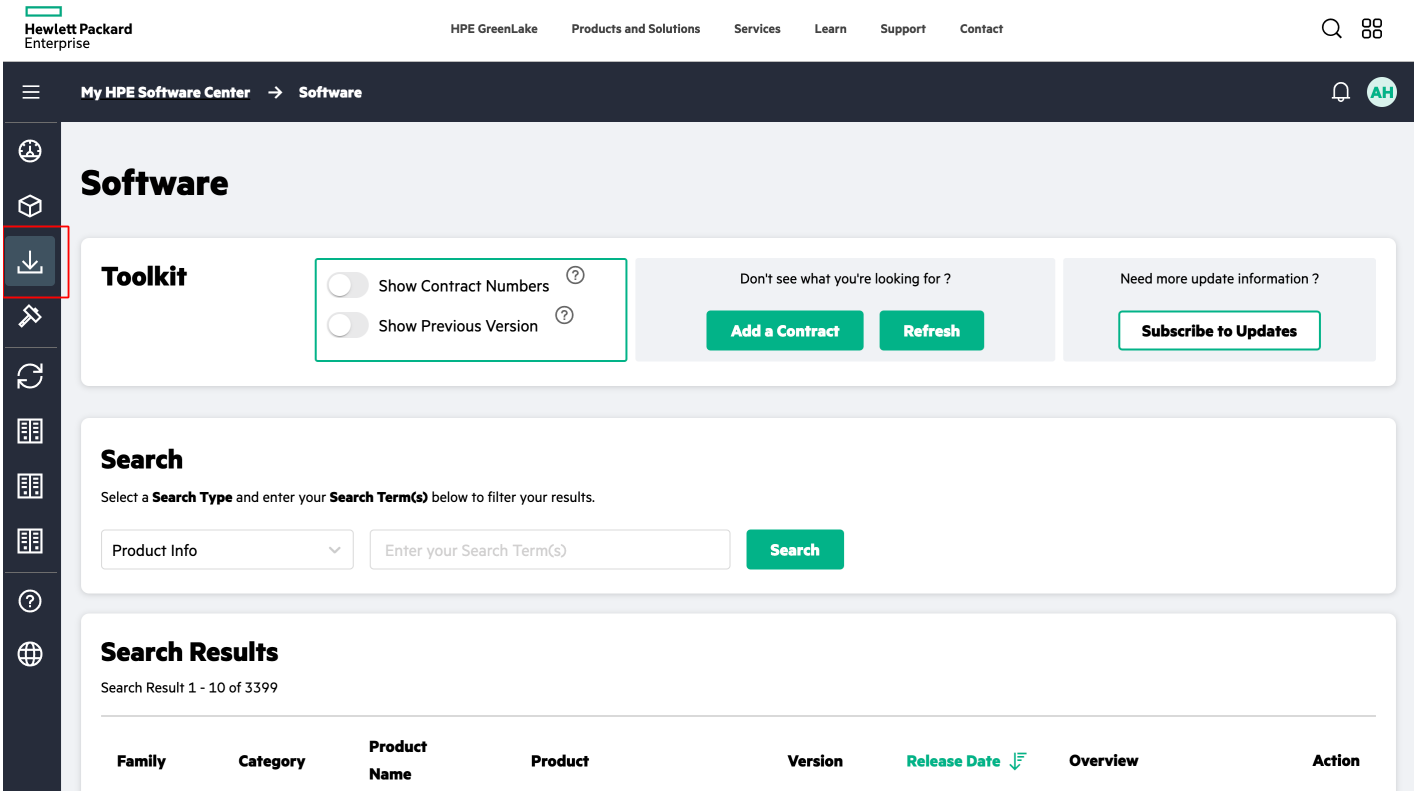
Provsioning the First Workload

All groundwork is now laid to begin provisioning workloads to the HVM cluster. Launch the wizard by going to Provisioning > Instances and clicking + ADD. Select an HVM-type Instance and click NEXT. You'll once again notice the Group and Cloud we created in this guide can be selected. You'll also specify a plan (VM size), resource pool (cluster), image, and cluster host, among a few other selections. After clicking NEXT, you'll land on the Automation tab where a set of Tasks can be selected to automate the deployment and configuration of the new Instance. Once the wizard is fully completed, a new Instance will be provisioned to the HVM cluster. You are now ready to add more of your images, add more automation tasks, and monitor workloads that are running on your clusters.

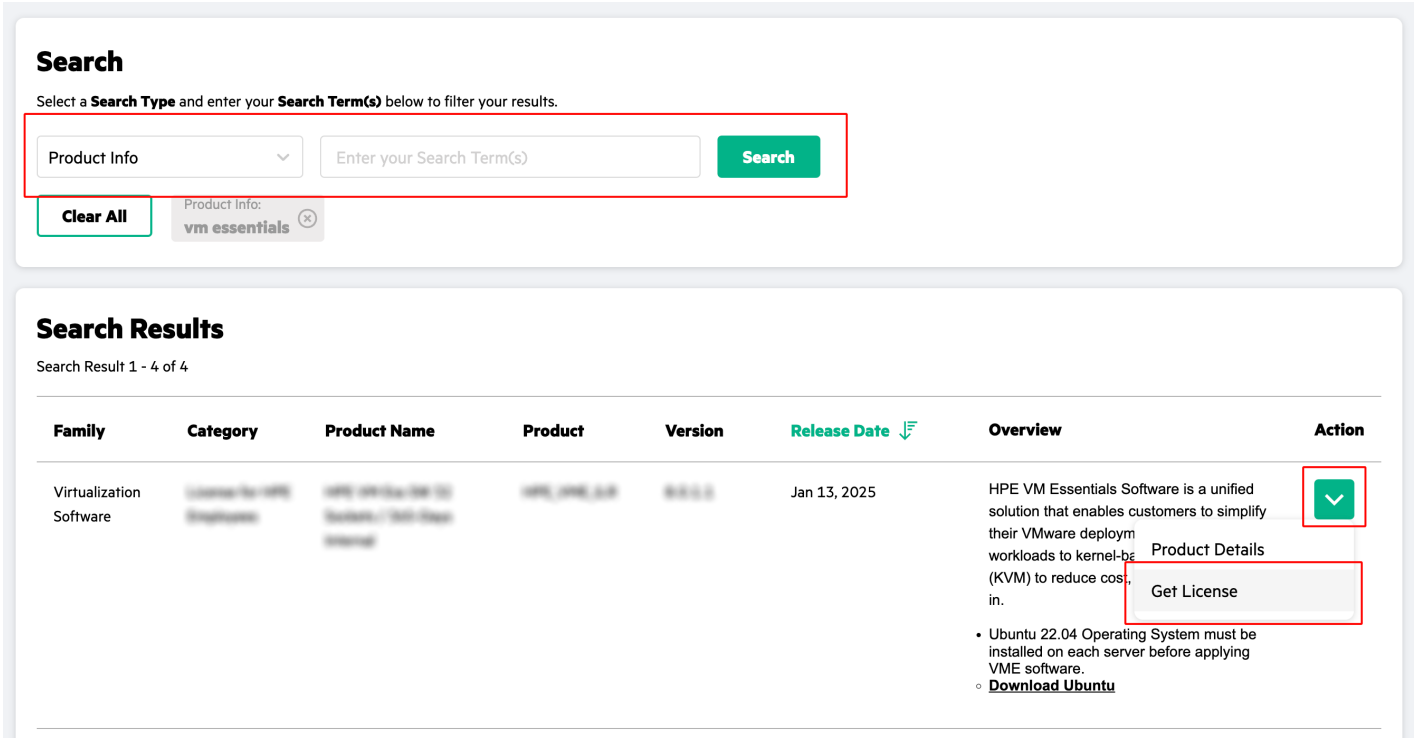
Upgrading the Manager

To upgrade the VM Essentials manager, you'll need to obtain the `.deb` upgrade package(s) from the HPE Software Center. Reach out to your account manager if you're unable to access the downloads as described in the next paragraphs. For an upgrade, you'll need the debian package (not the ISO, which is for first-time installation). If you are performing an offline upgrade, you will also need the "supplemental" debian package.

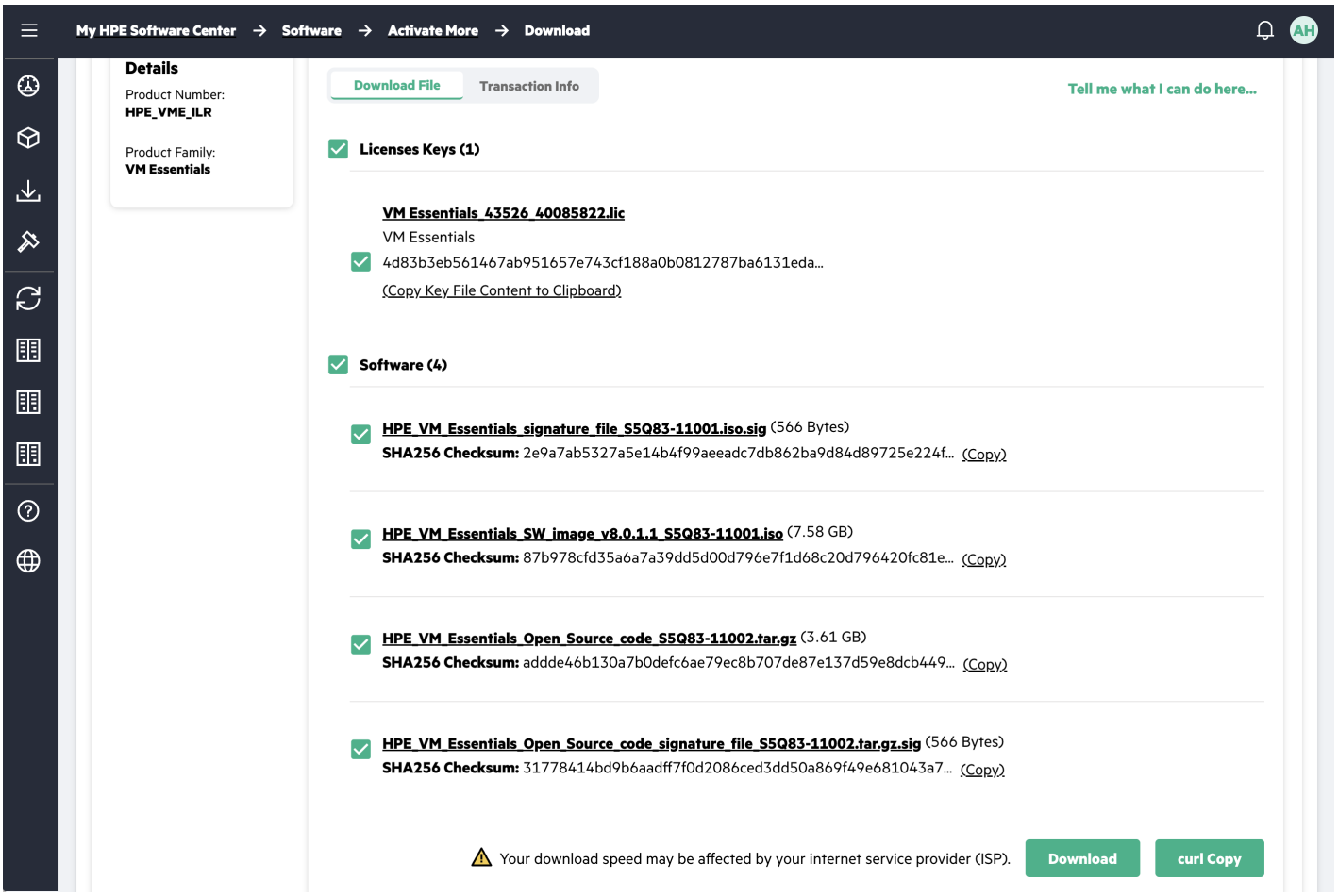
Once logged into My HPE Software Center, click on the "Software" section from the side navigation.



Within the "Software" section, search for HPE Morpheus VM Essentials Software amongst your other software entitlements. A "Product Info" type search for the term "HPE Morpheus VM Essentials Software" may work but depending on the entitlements present in the account and future changes to search functionality, a slightly different search might be required. Once VM Essentials is successfully returned, click on the dropdown menu under "Action" and click on "Get License."



From the download page, you'll see software packages, signature files and license files. Mark the checkbox next to any that you need and download them to your computer.



For an upgrade, we only need the `.deb` file available in the software center (and potentially the "supplemental" debian package as well if this will be an offline upgrade). To continue, copy the `.deb` file(s) over to the VM Essentials manager VM. On Linux, this could be done with `scp` (`scp /path/to/file.deb username@<VM IP address>:/path/to/destination`). You'll need the VM user's password unless you're using SSH keys. Alternatively, you may also click the "curl Copy" button to download a .txt file containing a curl command which you can paste into a terminal session connected to the HPE Morpheus VM Essentials Manager VM.

With the `.deb` file in place, we need to open a console connection to the VM Essentials manager VM to perform the actual upgrade. There

are a number of methods to accomplish this but below are two examples from either an HVM host or from your own computer.

Subtopics

- Setup from the HVM host
- Setup from another computer
- Upgrading

Setup from the HVM host

Confirm the manager VM name (`virsh list`) and connect with `virsh console <vm name>` . This starts a local VNC serial connection. This method only works if the host has GUI capabilities installed, which means the host must be running Ubuntu Desktop or Ubuntu Server with GUI services installed.

Setup from another computer

Confirm the manager VM name (run `virsh list` on the HVM host). Next, make note of the VNC port and password for the VM Essentials manager VM. This is done by running `virsh edit <vm name>` on the HVM host and finding it within the block beginning `<graphics` . This block is typically near the bottom of the XML. Having obtained this information, move back over to your own computer (must be a computer with a desktop terminal, access to the VME host, and GUI capabilities). Connect to the SSH tunnel: `ssh -L <VNC PORT>:127.0.0.1:<VNC PORT> <VME Host User>@<Host IP/hostname>` . Then, using a VNC viewer (for example, VNCViewer64), connect to `localhost:<VNCPort>` . Use the password obtained from the VM XML viewed earlier.

Upgrading

Having copied over the needed files and connected to the VM Essentials manager VM, the upgrade is completed in just a few commands. These commands will stop the current services, install the package, and then reconfigure the Manager. Replace the placeholder `.deb` file in the commands below with the correct path and file name of the package you've copied over.

> **IMPORTANT**
>
> Upgrading VM Essentials manager will result in downtime of at least a few minutes. Ensure users are not doing critical work during the upgrade window. This downtime applies only to the Manager itself and has no effect on the hypervisor host(s) or any provisioned VMs currently running.

```
sudo morpheus-ctl stop morpheus-ui
sudo dpkg -i xxxx.deb
sudo dpkg -i xxxx.supplemental.deb  # Optional -- Only for offline upgrades
sudo morpheus-ctl reconfigure
```

All services will automatically start during the reconfigure process. After the reconfigure has succeeded, tail the UI service to watch UI startup logs with `morpheus-ctl tail morpheus-ui` . Once the UI service is up and running, the upgrade process is complete. Attempt to reach your appliance normally through a web browser to confirm success.

> **NOTE**
>
> Services will be stopped during package installation and started during the reconfigure process, including the `morpheus-ui` service. If the reconfigure process is interrupted or fails, the `morpheus-ui` service may need to be manually started or restarted. In certain situations if another service hangs on starting during reconfigure, run `systemctl restart morpheus-runsvdir` then reconfigure and restart `morpheus-ui` if successful.

Following upgrade, it's advisable to check for any available HVM Host Agent upgrades. To upgrade the HVM Host Agent, navigate to an HVM Host detail page, expand the ACTIONS menu, and click "Upgrade Agent." This process must be repeated for each HVM Host that

makes up the HVM Cluster. Alternatively, you could also select "Download Agent Script" to download an Agent upgrade script which can be run when connected to the host through a terminal session. The Agent upgrade scripts are Host-specific so an individual script would need to be downloaded for each HVM Host.

Upgrade Compatibility Table

This section contains a table of compatible upgrade paths. The far left column contains the HPE Morpheus VM Essentials Manager version you're starting from. The columns to the right indicate versions compatible for upgrade from your starting version. If the version number is listed, it is a compatible upgrade path. If an "**X**" is listed instead, the upgrade path is unsupported.

From Version	To Version								
8.0.1 →	8.0.2	8.0.3	8.0.4	8.0.5	8.0.6	8.0.7	8.0.8	8.0.9	8.0.10
8.0.2 →		8.0.3	8.0.4	8.0.5	8.0.6	8.0.7	8.0.8	8.0.9	8.0.10
8.0.3 →			8.0.4	8.0.5	8.0.6	8.0.7	8.0.8	8.0.9	8.0.10
8.0.4 →				8.0.5	8.0.6	8.0.7	8.0.8	8.0.9	8.0.10
8.0.5 →					8.0.6	8.0.7	8.0.8	8.0.9	8.0.10
8.0.6 →						8.0.7	8.0.8	8.0.9	8.0.10
8.0.7 →							8.0.8	8.0.9	8.0.10
8.0.8 →								8.0.9	8.0.10
8.0.9 →									8.0.10

Compatibility Matrix for HPE Morpheus VM Essentials Software

Hardware and software is continually being tested and certified for compatibility with HPE Morpheus VM Essentials Software. For full details, see **The Compatibility Matrix for HPE Morpheus VM Essentials Software**. Items not listed in that document may be compatible but are untested.

Elevating to HPE Morpheus Enterprise

This section of the guide goes over the process for upgrading a HPE Morpheus VM Essentials Software appliance to a HPE Morpheus Enterprise Software appliance. HPE Morpheus VM Essentials and HPE Morpheus Enterprise are essentially the same product with HPE Morpheus VM Essentials focused specifically on management and consumption of HVM clusters and HPE Morpheus Enterprise adding on support for many other public and private Cloud types with a richer orchestration and automation experience (in addition to all features included with HPE Morpheus VM Essentials). HPE Morpheus Enterprise requires separate licensing, reach out to your account manager if you're unsure which licensing entitlements you can access. This guide is intended for HPE Morpheus VM Essentials administrators to upgrade their existing appliances and assumes a level of comfort with the Linux command line and the version upgrade process for HPE Morpheus VM Essentials and/or HPE Morpheus Enterprise. After upgrading, refer to HPE Morpheus Enterprise **documentation** for use guides to consuming the full HPE Morpheus Enterprise feature set.

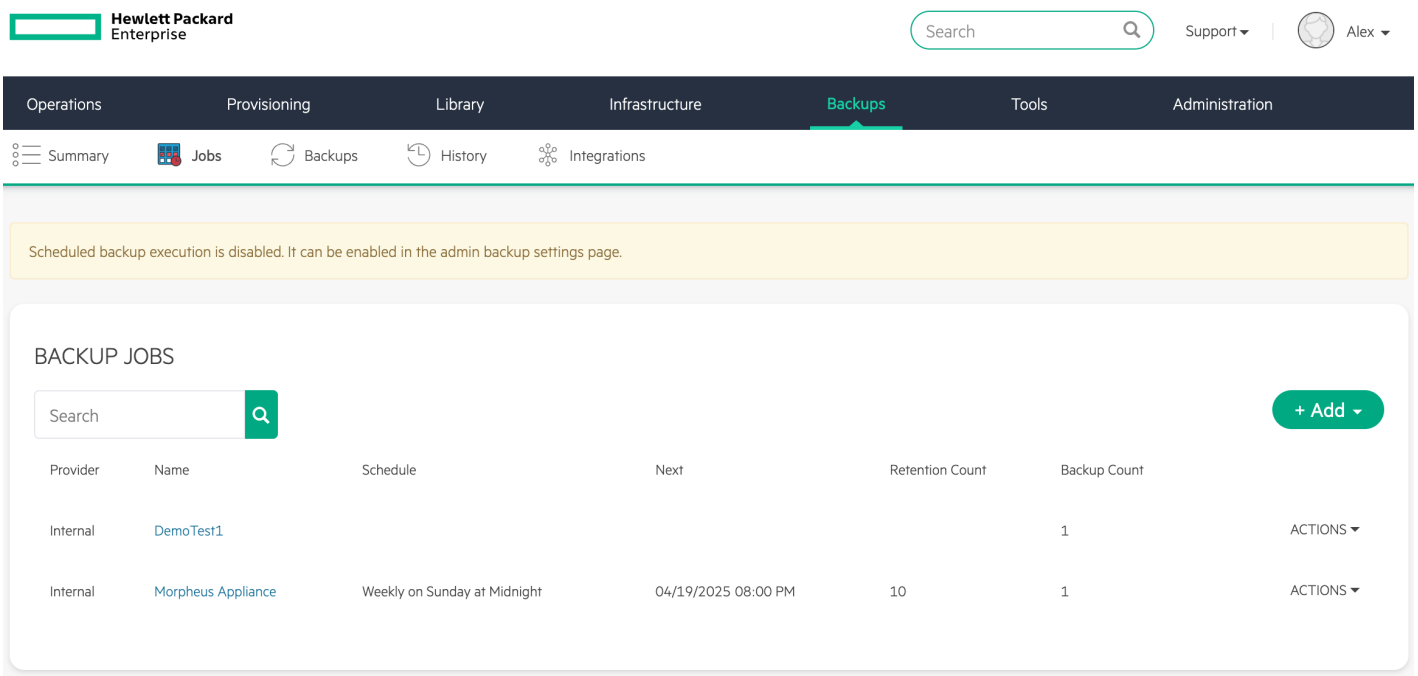
Prerequisites

- HPE Morpheus VM Essentials manager version 8.0.1+
- A bucket integrated with HPE Morpheus VM Essentials manager which can house an appliance database backup
- The HPE Morpheus Enterprise upgrade package (version 8.0.4+)
- A HPE Morpheus Enterprise license to add following the upgrade to enable the full feature set

Back Up the Appliance

Start by taking a fresh backup of the appliance database. View the appliance backup job by navigating to Backups > Jobs. As in the

screenshot, there should be a backup job named “Morpheus Appliance.” If an appliance backup job is not shown, enable the “Backup Appliance” setting within global settings (Administration > Settings > Backups).



Click Run Now and wait for a new green checkmark to appear indicating a new run of the backup job was successful.

Package Installation

Upgrading the HPE Morpheus VM Essentials manager to a HPE Morpheus Enterprise appliance is as simple as installing the HPE Morpheus Enterprise package over the existing HPE Morpheus VM Essentials package in a process very similar to version upgrades you may have done in the past. First, download the HPE Morpheus Enterprise `.deb` package. The download URL shown below is a placeholder, reach out to your account manager if you’re unsure where to find the download URL for the latest package.

```
wget https://url.to.morpheus-appliance_x.x.x-x.deb
```

Next, stop the HPE Morpheus VM Essentials UI.

```
sudo morpheus-ctl stop morpheus-ui
```

Install the HPE Morpheus Enterprise package and force it to overwrite.

```
dpkg -i --force-overwrite morpheus-appliance_x.x.x-x.deb
```

Wait for the installation to complete. There will be warnings about conflicts which may be safely ignored. When installation is complete, you will see a message similar to the screenshot below:

```
Thank you for installing Morpheus!
Configure and start the Morpheus admin web UI by running the following command:

sudo morpheus-ctl reconfigure

Morpheus should be reachable at https://vmem-01
Otherwise configure Morpheus for your system by editing /etc/morpheus/morpheus.rb file
and running reconfigure again.

WARNING! ROLLING UPGRADES FOR HA ENVIRONMENTS ONLY SUPPORTED WHEN UPGRADING FROM v7.0.3+ or v6.2.11
Performing a rolling upgrade on other versions will result in RabbitMQ deserialization errors.
Stop the morpheus-ui service on all app nodes prior to upgrading any other versions.

root@vmem-01:~#
```

Now, remove the HPE Morpheus VM Essentials package.

```
sudo apt-get remove -y hpe-vm-essentials
```

Following removal, restart any recommended services if prompted.

```
root@vmem-01:~# sudo apt-get remove -y hpe-vm-essentials
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages will be REMOVED:
  hpe-vm-essentials
0 upgraded, 0 newly installed, 1 to remove and 12 not upgraded.
After this operation, 2,598 MB disk space will be freed.
(Reading database ... 150374 files and directories currently installed.)
Removing hpe-vm-essentials (8.0.4-1) ...
Scanning processes...
Scanning candidates...
Scanning linux images...

Running kernel seems to be up-to-date.

Restarting services...
 systemctl restart morpheus-runsvdir.service

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
root@vmem-01:~#
```

We must now clean up OpenSearch directories. Currently, HPE Morpheus Enterprise uses ElasticSearch while HPE Morpheus VM Essentials manager uses OpenSearch. Migration through snapshots is not supported due to this incompatibility. In general, OpenSearch and ElasticSearch contain VM performance metrics. This data can be considered ephemeral and safely deleted as the default retention is only 30 days. HPE Morpheus Enterprise is planned to migrate to OpenSearch in the future and at that point, this cleanup step will not be required and metrics will persist across an upgrade to HPE Morpheus Enterprise. Remove the following directories:

```
rm -rf /var/run/morpheus/opensearch
rm -rf /opt/morpheus/service/opensearch
```

Next, run the reconfigure command. This will configure ElasticSearch for use with the upgraded appliance.

```
sudo morpheus-ctl reconfigure
```

Once the reconfigure is complete, make sure all HPE Morpheus Enterprise services are started

```
sudo morpheus-ctl status
```

If any services need started, use the following command:

```
sudo morpheus-ctl start {service name}
```

You can watch the logs to see when the UI comes back up:

```
sudo morpheus-ctl tail morpheus-ui
```

When the Morpheus ASCII logo appears, you should be able to reach the UI from a web browser.

Upgrading the License

Now that HPE Morpheus Enterprise UI is reachable, the license must be upgraded. Navigate to Administration > Settings > License where you'll see a field to paste in your license key. Once again, contact your account manager if you have questions on accessing your license key.

Finally, make sure you select the appropriate option of either stacking the license onto an existing license or replacing it. Then, click Update.

At this point, the process is complete. Now that the full Morpheus feature set is unlocked, refer to Morpheus **documentation** going forward.

Operations

Subtopics

- Dashboard
- Wiki
- Activity

Dashboard

The Dashboard is a single, high-level view into your environment which includes easy-to-read performance and configuration information. In many cases other areas within VM Essentials UI will allow you to drill deeper into the information presented in the dashboard.

Subtopics

- Environment
- System Status
- Favorites
- Instance Status
- Instances By Cloud
- Group Workloads
- Cloud Workloads
- Cluster Workloads
- Backups
- Task Executions
- Activity

Environment

- **Groups:** Total number of Groups currently created
- **Clouds:** Total number of Clouds currently integrated
- **Clusters:** Total number of clusters currently provisioned
- **Apps:** Total number of Apps currently provisioned
- **Instances:** Total number of Instances currently provisioned
- **Users:** Total number of VM Essentials user accounts

System Status

System status gives a high-level view of the health of the appliance. More detailed information can be viewed on the appliance health detail page (Administration > Health) and a more detailed breakdown of the meaning of each status indicator is in VM Essentials **health**

documentation.

Favorites

Any Instances you've "favorited" will appear here along with the Instance name, type, and IP address

Instance Status

The total number of Instances is listed along with a pie chart showing the statuses of each. Hover over each section of the pie chart to see the total number and percentage of Instances in that state. States may include running, stopped, provisioning, and more

Instances By Cloud

The total number of Clouds which currently have an Instance provisioned is shown. Hover over each section of the pie chart to see the total number and percentage of Instances provisioned to each Cloud

The number of Instances that have existed at any point in the day with additional breakdown to show the number provisioned to each Cloud. This number will include any pre-existing Instances which have carried over from previous days along with any new Instances that were provisioned and existed on that day even for a short time

Group Workloads

The instantaneous count of host or container records broken down by Group association

Cloud Workloads

The instantaneous count of host or container records broken down by Cloud association

Cluster Workloads

The instantaneous count of managed containers broken down by Cluster association

Backups

Displays the number of successful and unsuccessful backups over the last day, week or month

Task Executions

Displays the number of successful and unsuccessful Task executions over the last day, week or month

Activity

The activity list displays the last few events that have taken place in VM Essentials by any user. This could be new provisioned workloads, deleted workloads, backups, or a number of other things. A more complete list of recent activities can be viewed in Operations > Activity

Wiki

The Morpheus Wiki is a tenant-wide, RBAC-controlled, auditable Wiki that allows easy UI, API and CLI access to information, notes, configurations or any other data needed to be referenced or shared with others. Wiki pages can be created directly from the Wiki tab of the detail page for various resource types, including Clouds, Groups, Servers, Instances, and Clusters. Wiki pages created this way are automatically categorized under the appropriate resource type. Additional Wiki pages and custom categories can be created when viewing the whole Wiki at Operations > Wiki. Here you will also see the complete Wiki, including pages created on various object detail pages which are categorized appropriately.

Subtopics

- Highlights
- Creating Wikis
- Hosting Images

Highlights

- Main Wiki section is at Operations > Wiki
- Wiki tabs are on Clouds, Groups, Instances, Hosts, VMs, and Clusters detail pages
- Additional Wiki Pages and Categories can be created from Operations > Wiki
- When a Wiki tab is populated, a Page is automatically added and accessible at Operations > Wiki
- The Wiki is accessible from the UI, CLI and API.
- Wiki access is RBAC-controlled via the Operations: Wiki permission in Roles (None, Read and Full)
- Page updates are stamped with the “Last Updated By” user and the time the edit was made
- Wiki pages can be searched from `/operations/wiki` or navigated from `/operations/wiki-page/page-index`
- All wiki pages are encrypted using AES 256-bit encryption
- Wiki pages use Flexmark for Markdown. Annotate your Wiki pages with headers, text styling, code blocks, hyperlinks, and more as needed
- Create a new page with title “Home” to replace the default Wiki landing page that ships with VM Essentials

Creating Wikis

The Wiki service ties into assets throughout the environment. Create pages for Instances, hosts, groups, Clouds, and even clusters directly on their detail pages (see the Wiki tab). Users may also just create general notes pages in the centralized Wiki section (Operations > Wiki)in Markdown format.

Creating your first page is as simple as clicking the Create Page button from the Wiki home page (Operations > Wiki). Write down some content, give the page a title, and click SAVE. The Wiki will also keep track of who last edited a page and when. The beauty of this Wiki is that it's clean and easy to write down notes related to various parts of your application deployment or infrastructure without going to an external tool. Many VM Essentials constructs, such as Instances, hosts, and more, also have their own Wiki page. Navigate to the detail page for the selected construct, open the Wiki tab, and click EDIT to add content.

IMPORTANT

All wiki pages are encrypted using AES-256 bit encryption. Though we don't advise storing passwords in a Wiki document (services like Cypher are for that), role-based access control also can properly restrict access to content related to Instances or hosts which the user may not have access to.

Hosting Images

It's possible to add images to your Wiki pages and images can be sourced from the Internet, a Cloud storage bucket (like an AWS S3 Bucket), or even from files stored to the VM Essentials appliance's local file system. Within your Wiki page markdown, add your image using the following syntax:

```
![my alt text](https://myimage.com/image.jpg)
```

The text within the square brackets [] sets the HTML "alt" description for the image and the URL within parentheses () is the "src" URL for the image. The VM Essentials **Archives** feature is a great resource for hosting images for use in Wiki. Archives can target cloud storage buckets or even file shares on the VM Essentials appliance local storage. VM Essentials generates an access URL for each file stored in Archives, simply target this URL in your markdown to show an image stored in VM Essentials Archives within your Wiki pages.

Activity

The Activity section displays a recent activity report for Auditing. VM Essentials defines an activity as any major action performed on an instance or server, such as, but not limited to adding a server, deleting a server, provisioning an instance, deleting an instance, creating a backup, etc... This view can be searched and filtered by type, user, and date range.

Subtopics

Activity
History

Activity

There are four types of activities that are displayed in the Activity Reports:

- Backup
- Provisioning
- Alert

Subtopics

To View a Recent Activity report:
Review

To View a Recent Activity report:

Procedure

1. Select the `Operations` link in the navigation bar.
2. Select `Activity` in the sub navigation bar.

Results

Recent activity is displayed in order from recent to oldest. This view can be searched and filtered by type, user, and date range.

Review

To review the item that generated the activity, click the name of the activity and it will go to a new page and display that item. The list of activity can be filtered by type, user or date range.

NOTE

Deleted activities are displayed as an alert and do not contain a link to the event item. If the activity is not a deletion event we provide a link on the activity name to go to the item the activity occurred on. Delete activity alerts are shown for Instances, servers, Clouds, and Groups.

History

The HISTORY section shows process history from Instance processes. This is an aggregate view of the `History` tab contained in each Instance detail page.

Processes can be expanded to view all process steps and process history detail including output and errors.

Access to HISTORY is given by the `Operations:Activity` Role permission.

The Logs displayed in `Administration - Health - Morpheus Logs` are from `/var/log/morpheus/morpheus-ui/current`. These logs show all ui activity and are useful for troubleshooting and auditing.

NOTE

Stack traces in `Administration - Health - Morpheus Logs` are filtered for VM Essentials services. Complete stack traces can be found in `/var/log/morpheus/morpheus-ui/current`.

Provisioning

There are many capabilities in the VM Essentials provisioning engine ranging from virtual machines bound for VMware vCenter and HVM cluster targets to containerized workloads targeting Docker. Deployment management and library template construction are also core aspects of the provisioning engine. This section of VM Essentials documentation covers the provisioning engine itself while the Library section covers template building, image management, and automation stacks.

Subtopics

Requirements

Provisioning Concepts

Instances

Requirements

Provisioning Instances typically involves many steps beyond starting a workload and VM Essentials is centered around automating everything for your application to be fully operational. There is a lot that goes on when spinning up an Instance, and to make the magic happen a few requirements need to be met.

> **IMPORTANT**
> By default, Agent Installation is enabled when provisioning unless deselected on the Virtual Image or SKIP AGENT INSTALL is selected from the provisioning wizard.

Subtopics

VM Provision Steps
Virtual Images
Agent Install

VM Provision Steps

While many things can happen during an individual provisioning process, the basic order is:

- Look for the Virtual Image

  VM Essentials will check if the Virtual Image set on the Node Type or selected from a list of images during provisioning is already available to the HVM cluster or to a vCenter Cloud target. If not and it is an uploaded or local image, VM Essentials will attempt to upload the image to the HVM cluster or vCenter target.

  Upload Image

  For uploaded or local images that do not exist in the target, VM Essentials will need to upload the Image. Ensure the Virtual Image is valid for the target technology, the image meets the target upload requirements, and VM Essentials has network access and permissions to upload the image.

  > **NOTE**
  > When uploading an image to a VMware Cloud, the Virtual Image is copied directly to the target ESXi host, NOT through the vCenter server. Ensure the VM Essentials Appliance(s) can resolve target ESXi hostnames and connect on port 443 for successful vmdk/ova uploads.

  Clone Image

  Once the Image is confirmed available in the target cloud, VM Essentials will clone the Image to the target Datastore.

  > **NOTE**
  > The target host must have access to the target Datastore of the Image

- Reconfigure Image

  Once cloned, VM Essentials will resize the Image based off provisioning parameters

- Cloud-init (if enabled)

  Attached cloud-init iso

When using cloud-init, VM Essentials will attach a tiny metadata iso to the new VM. Network, Machine, User and any other cloud-init metadata will be sourced from this iso.

VM Tools

VM Essentials will run guest customizations via VMware VM Tools, including network config when assigning static IP addresses.

- Wait for Power On status and Network info

  VM Essentials will wait to hear back from the target that the VM has successfully started and has an IP address.

  > **NOTE**
  > If VM TOOLS INSTALLED? is NOT checked on the source Virtual Image configuration, VM Essentials will skip waiting for network.

- Finalize

  By default, this step will include Agent installation.

  > **IMPORTANT**
  > If the VM is stuck in finalize for long periods of time, this typically means the Agent cannot be installed or has not been heard back from. This will result in a ! warning Instance status upon provisioning completion.

  If agent installation is not possible or is not desired, uncheck “Install Agent” on the source Virtual Image configuration or select “Skip Agent Install” during provisioning to speed up provisioning completion.

Virtual Images

The most common provisioning method within VM Essentials involves Virtual Machines, and the most important part of provisioning a VM is the Virtual Image. When provisioning a VM, VM Essentials will need to do a few things depending on the location of the Virtual Image and if agent install and console access are desired.

Synced Images need to be properly configured

VM Essentials gathers as much metadata for synced images as possible, but depending on the target (HVM cluster or VMware vCenter), OS, image configuration, or agent install settings, the synced Virtual Images may not be ready to provision without some configuration within VM Essentials. The Virtual Image is already at the target Cloud, but datastore selection, credentials, cloud-init settings, networks, and security settings on the Virtual Image can cause provisioning issues.

Local/Uploaded Virtual Images

Images uploaded to VM Essentials are configured during the Add Virtual Image process, however VM Essentials in most scenarios will still need to copy the Virtual Image to the target Hypervisor/Cloud upon the first provision to the target Cloud. In addition to the requirements for provisioning a synced Virtual Image, copying an uploaded Virtual Image to the target Cloud is required. Network and image configurations can cause upload failures, resulting in provisioning issues.

Subtopics

Synced Images
Local Virtual Images

Synced Images

When a provisioning target (Cloud) is added, all available image and template records from that Cloud will be synced in regardless of Inventory settings on the Cloud. These image records will be available in the Virtual Images section and can be provisioned by using the

target clouds generic Instance Type (ex. By selecting the HVM or VMware Instance Type from the provisioning wizard).

> **NOTE**
>
> Synced Virtual Images are just metadata records in VM Essentials pointing to the image in the target Cloud. The actual image files are not copied/imported to VM Essentials manager.

Before provisioning a synced Virtual Image, ensure the image is configured properly:

Name

Name of the Virtual Image in VM Essentials. This can be changed from the name of the image, but editing will not change the name of the actual image file.

Operating System

Specifies the platform and OS of the image. All Windows images will need to have Operating System specified on the Virtual Image, as VM Essentials will assign Linux as the platform for all images without an operating system specified.

Minimum Memory

The Minimum Memory setting will filter available Plan options during provisioning. Plans that do not meet the minimum memory value set on the Virtual Image will not be provided as Plan choices by the provisioning wizard.

Cloud Init Enabled?

On by default, uncheck for any image that does not have Cloud-Init or Cloudbase-Init installed.

> **IMPORTANT**
>
> Provisioning a Virtual Image that has Cloud Init Enabled? checked on the Virtual Record in VM Essentials but does not have cloud-init installed will result in immediate provisioning failure.

Install Agent

On by default, uncheck to skip Agent install. Note this will result in the loss of utilization statistics, logs, Task execution, and monitoring (Some utilization stats are still collected by Agent-less workloads).

Username

An existing Username on the Image. This is required for authentication, unless VM Essentials is able to add user data, Cloud-Init, Cloudbase-Init or Guest Customizations. If Cloud-Init, Cloudbase-Init Guest Customizations or Nutanix Sysprep are used, credentials are defined in Administration > Settings > Provisioning and User Settings. If credentials are defined on the Image and Cloud-Init is enabled, VM Essentials will add that user during provisioning, so ensure that user does not already exist in the image (aka `root`). For Windows Guest Customizations, VM Essentials will set the Administrator password to what is defined on the image if Administrator user is defined. Do not define any other user than Administrator for Windows Images unless using Cloudbase-init. VM Essentials recommends running Guest Customizations for all Windows Images, which is required when joining Domains as the SID will change.

Password

Password for the existing user on the image if the Username field is populated.

Storage Provider

Location where the Virtual Image will be stored. Default Virtual Image Storage location is `/var/opt/morpheus/morpheus-ui/VMs`. Additional storage providers can be configured in Infrastructure > Storage.

Cloud-Init User Data

Accepts what would go in `runcmd` and can assume bash syntax. Example use: Script to configure satellite registration at provision time.

Auto Join Domain?

Enable to have Instances provisioned with this image auto-join configured domains (Windows only, domain controller must be configured in Infrastructure > Network and the configured domain set on the provisioned to Cloud or Network).

VirtIO Drivers Loaded?

Enable if VirtIO Drivers are installed on the image for provisioning to KVM-based hypervisors, such as HVM cluster

VM Tools Installed?

On by default, uncheck if VMware Tools (including OpenVMTools) are not installed on the Virtual Image. VM Essentials will skip

network wait during provisioning when deselected.

Force Guest Customization?

VMware only, forces guest customizations to run during provisioning, typically when provisioning to a DHCP network where guest customizations would not run by default. This is required for host/computer name definitions. domain joining, licenses and user definitions when using DHCP.

Trial Version

Enable to automatically re-arm the expiration on Windows Trial Images during provisioning.

IMPORTANT

Provisioning a Virtual Image that has Cloud Init Enabled? checked on the Virtual Record in VM Essentials but does not have cloud-init installed will result in immediate provisioning failure.

IMPORTANT

For Linux images without cloud-init, an existing username and password must be defined on the Virtual Image record for Agent Install, Domain joining, licensing, script execution and other automation, and SSH or RDP Console access.

Local Virtual Images

A Local Virtual Image means it has been uploaded to VM Essentials. To provision, VM Essentials will need to upload the image to the provisioning target upon first provision.

- Ensure the Virtual Image is valid for the target Cloud, the Image meets the target cloud upload requirements, and VM Essentials has network access and permissions to upload the image.

NOTE

When uploading an image to a VMware Cloud, the Virtual Image is copied directly to the target ESXi host, NOT through the vCenter server. Ensure the VM Essentials Appliance(s) can resolve target ESXi hostnames and connect on port 443 for successful vmdk/ova uploads.

Once a local Virtual Image has been uploaded to a provisioning target, subsequent provisions will use the image local to the target instead of uploading again as long as the copied image is still available.

Agent Install

When provisioning an Instance, there are some network and configuration requirements to successfully install the Agent. Typically when a VM Instance is still in the provisioning phase long after the VM is up, the Instance is unable to reach VM Essentials, or depending on Agent install mode, VM Essentials is unable to reach the Instance.

The most common reason an Agent install fails is the provisioned Instance cannot reach the VM Essentials Appliance via the `appliance_url` set in Administration > Settings over both 443 and 80. When an Instance is provisioned from VM Essentials, it must be able to reach the VM Essentials appliance via the `appliance_url` or the Agent will not be installed.

In addition to the main `appliance_url` in Administration > Settings, additional `appliance_urls` can be set per Cloud in the Advanced options of the Cloud configuration pane when creating or editing a Cloud. When this field is populated, it will override the main appliance URL for anything provisioned into that Cloud.

TIP

The VM Essentials current log, located at `/var/log/morpheus/morpheus-ui/current`, is very helpful when troubleshooting Agent installations.

Subtopics

Agent Install Modes
SSH/Winrm
VMware tools (vmtools) RPC mode
Cloud-Init Agent install mode

Agent Install Modes

There are 3 Agent install modes:

- SSH/WinRM
- VMware Tools
- Cloud-init

Subtopics

For All Agent Install modes

For All Agent Install modes

When an Instance is provisioned and the Agent does not install, verify the following for any agent install mode:

- The VM Essentials `appliance_url` (Administration > Settings) is both reachable and resolvable from the provisioned node.
- The `appliance_url` begins with to `https://`, not `http://`.

> **NOTE**
> Be sure to use `https://` even when using an IP address for the appliance.

- Inbound connectivity access to the VM Essentials Appliance from provisioned VMs and HVM cluster hosts on port 443 (needed for Agent communication)
- Private images (those not provided with VM Essentials by default) must have their credentials entered. These can be entered or edited in the Library > Virtual Images section by clicking the edit button (pencil icon) next to the appropriate image.

> **NOTE**
> Administrator user is required for Windows agent install.

- The Instance does not have an IP address assigned. For scenarios without a DHCP server, static IP information must be entered by selecting the Network Type: Static in the Advanced section during provisioning. IP Pools can also be created in the Infrastructure > Network > IP Pools section and added any Cloud's network section for IPAM.
- DNS is not configured and the node cannot resolve the appliance. If DNS cannot be configured, the IP address of the VM Essentials appliance can be used.

SSH/Winrm

Subtopics

Linux Agent
Windows Agent

Linux Agent

- Port 22 is open for Linux images, and SSH is enabled
- Credentials have been entered on the image if using a custom or synced image. Credentials can be entered on images in the Library > Virtual Images section.

Windows Agent

- Port 5985 must be open and WinRM enabled for Windows images.
- Credentials have been entered on the image if using custom or synced image. Credentials can be entered on images in the Library > Virtual Images section.

NOTE
Administrator user is required for Windows agent install.

VMware tools (vmtools) RPC mode

- VMware tools is installed on the template(s)
- Credentials have been entered on the Image if using an uploaded or synced image when Cloud-init or Guest Customizations or Sysprep for Windows are not used. Credentials can be entered on Images in the Library > Virtual Images section.

Cloud-Init Agent install mode

- Cloud-Init is configured in Administration > Settings > Provisioning section
- Provisioned image has Cloud-Init (Linux) or Cloudbase-Init (Windows) installed

Provisioning Concepts

VM Essentials is a powerful provisioning and management platform for HVM clusters and VMware vCenter private cloud. Compared to other CMP platforms in the space, some terminology and concepts may differ. These concepts are documented in this section along with places where terminology may be slightly different compared with other platforms or with common industry parlance.

Subtopics

Instances
Containers / Nodes / Virtual Machines
Hosts / Servers

Instances

VM Essentials starts with provisioning Instances. In some platforms, an Instance is representative of a singular object like a virtual machine in VMware vCenter. In VM Essentials, this concept was rethought. An Instance is more of a representation of a resource or service. This service may involve several virtual machines, as in the case of a database cluster or horizontally-scaled web servers.

When viewing an Instance detail page, one is able to look at details and statistics specific to a virtual machine or container. VM Essentials simply helps simplify the management model for tracking these services.

Containers / Nodes / Virtual Machines

In relation to Instances, an Instance can have many nodes. A node is a generic representation of a container or a virtual machine. In most cases, VM Essentials will represent a node as a Container or Virtual Machine depending on the provisioning engine used for the Instance (workload provisioned to a HVM cluster as opposed to a Docker cluster, for example). Node is just a generic naming representation when referring to these types of items. The public VM Essentials developer API, however, often refers to both virtual machines and Docker containers as “containers”. The UI was updated to better delineate this concept for easier understanding but, in essence, the name is valid for both concepts of containerized environments as well as virtual machines.

Hosts / Servers

This concept is mostly tailored to users of VM Essentials who are responsible for managing and maintaining the underlying infrastructure integrations. A Host typically refers to a Docker Host in which a container (within an Instance) is running, or a hypervisor that virtual machines can be provisioned onto. A server is the underlying general representation of a physical or virtual server. It could be a Host representation, a Virtual Machine, or even a Bare Metal delineation.

When a user provisions a VM-based Instance, a corresponding server record is created to represent the link to the actual resource via the underlying provisioning engine. This may seem a bit odd but provides an aspect of VM Essentials that is quite powerful. This singular concept is what allows VM Essentials to ingest “brownfield” environments. We do not need to start clean. VM Essentials can be integrated into existing environments and manage existing virtual machines. The way VM Essentials does this is by periodically syncing existing VMs from the added cloud integrations. A server record will be created and periodically updated (every five minutes, by default) with realtime information and changes. This, in essence, provides CMDB-like capabilities as well. When a server is discovered, the user (given the appropriate access) can convert the virtual machine to a managed Instance. When this is done, a corresponding Instance is made in the provisioning section of VM Essentials and the VM Essentials Agent can optionally be installed to provide more refined guest operating system-level statistics and logging.

Instances

Instances are a great starting point for taking advantage of self-service features and spinning up both VMs and containers. The top of the main Instances page shows overall statistics for the listed Instances, including count, status, and resource utilization. You can search for Instances by name, or filter by group, type, or category.

The Instance list contains important information about each Instance, including the Instance name, environment tag, type, IP address and port info, Instance version, the number of virtual machines or containers, the Group, and the associated Cloud.

Subtopics

- Creating Instances
- Managing Instances

Creating Instances

Creating Instances

The Instance catalog is where you will create new workloads targeting the HVM clusters and/or VMware vCenter Clouds available to the VM Essentials environment. The list contains only Instance Types relevant to the provisioning engines which enabled and integrated in the current appliance.

To get started, simply click the + Add button in the upper right of the Provisioning > Instances page. A modal will display allowing the catalog to be searched. Once an item is selected, it is just a matter of following the steps through the wizard.

TIP

The Instance catalog can be customized via role-based access control (RBAC) to restrict provision types only to certain Roles. It is completely customizable.

The next step will ask for a Group and Cloud to be selected. The Group is an abstract representation that can contain multiple HVM clusters or VMware vCenter integrations. Clouds can be in multiple Groups and Groups are also useful for using RBAC to restrict provisioning access and set retainment policies. The wizard continues by allowing us to choose a name for the Instance as well as an environment.

NOTE

Currently the Environment option is most useful for presenting the user with informative metadata around the Instance when coming back to it later.

Moving on, it is now time to configure the Instance. Depending on the Instance Configuration that is chosen, fields will change. This can include cloud-specific fields (i.e. target hosts for HVM clusters or datastores for VMware Clouds). There will also be options like setting an initial user account. Some of these fields are optional and will be represented as such in the wizard.

One last step before the Instance can be provisioned is the Automation step. It is here that you can select Tasks which will run during the provision process and these Tasks must complete successfully in order for the Instance status to be reported as successful. Tasks are either Bash or Powershell scripts which can be configured in the Library > Automationsection.

Now that the steps are completed for provisioning the selected Instance type, simply review your selections and complete. The Instance will automatically show up in the Instances list and its provisioning state will be represented. Depending on what was provisioned this step can range from seconds to minutes.

Subtopics

- Converting Discovered Resources to Managed Instances

Converting Discovered Resources to Managed Instances

When creating new cloud integrations (or updating existing ones), users may opt for VM Essentials to onboard any existing resources that currently reside in the Cloud. For example, these may be virtual machines that exist on vCenter hosts prior to integration with VM Essentials. With the Add/Edit Cloud modal open, mark INVENTORY EXISTING INSTANCES for VM Essentials to automatically onboard these resources. Not only will VM Essentials inventory these hosts at the time the cloud is integrated (or updated), it will also continue to poll the target cloud every five minutes (by default) for newly added or removed servers. Users can see these discovered servers by looking in Infrastructure > Compute. Depending on the type of resource, it may appear on the Virtual Machines tab, the Containers tab, or another tab. Additionally, we can see a list of discovered servers on Cloud detail pages (Infrastructure > Clouds > Selected Cloud). Just click on the tabs for VMs, Containers or Hosts tab. Discovered resources will be indicated as such whereas containers which are associated with a managed Instance will be marked as a “Managed”.

Additionally, VM Essentials allows users to convert discovered resources into managed Instances. Begin from the server detail page (Infrastructure > Compute > Virtual Machines > selected machine) and from the ACTIONS menu select “Convert to Managed”. At this point, we must make a number of selections:

- Select a Group (this dropdown contains a filtered list of Groups in which the associated Cloud resides)
- Username and password for a seeded account
- Opt to install VM Essentials Agent or not
- Select the Instance Type which should be associated with the new Instance containing this VM
- Identify the operating system
- Select a Plan (this dropdown contains a filtered list of plans which correlate to the size of the VM)

Finally, click EXECUTE. Once this process is completed, the server will be indicated as “Managed” in the servers list. Additionally, a new Instance will appear on the Instances List page (Provisioning > Instances). We can now work with it in the same way we can work with any other Instance, such as by expanding the Instance horizontally with added nodes.

Managing Instances

Instance actions allow you to perform numerous management tasks on instances. The actions available depend on the instance type, hypervisor, roles permissions, and instance state. Actions can be accessed from the Instances list page or from an Instance detail page.

Edit

Edit the Name, Description, Environment, Group, Tags, and Owner for the Instance.

Delete

Deletes the Instance.

IMPORTANT

Deleting an Instance will delete the actual underlying VMs or Containers and cannot be undone.

TIP

You can change the owner of an instance easily by selecting the edit button and entering a new owner in the corresponding field.

Subtopics

Actions
Performing Instance Actions
Notes

Actions

Available options in the Actions dropdown can include:

Suspend

Puts the VM in a suspended state without shutting down the OS.

Stop/Start/Restart Server

Stops, Starts or Restarts the Virtual Machine.

Import as Image

Clones and exports VM in its current state to target Storage provider and adds a Virtual Image record with metadata matching the source Instance configuration.

Clone to Image

Clones and converts VM in its current state to image in the source Cloud and adds a Virtual Image record with metadata matching the source Instance configuration.

Lock/Unlock Instance

A locked Instance cannot be deleted until it is unlocked.

Reconfigure

The Reconfigure action allows service plan, disk, CPU, memory, networks and storage controller changes. Available options depend on the type and Plan configuration. Some resize actions require an Instance restart.

Clone

Creates a new Instance from the Instance at its current state.

Backup

Immediately executes a backup of the Instance. This is only available for Instances with backups enabled.

Run Task

Select a currently-configured Task to run against the Instance. Tasks can be created and edited in Library > Automation.

Add Node

Adds an additional node to the configuration. Additional options and configurations are required in the add node wizard depending on Instance configuration and type.

Eject Disk

Ejects attached disks (ISOs).

Clone to Template (VMware)

Creates a new VMware Template from the Instance with corresponding VM Essentials Virtual Image record.

TIP

Scrolling down in the Actions dropdown may be necessary to see all options.

Performing Instance Actions

Procedure

1. Select the Provisioning link in the navigation bar.
2. From the Instances list, select the desired Instance.
3. Click the Actions dropdown button and select an Action.

Notes

Every Instance has a Wiki section for adding useful information about the Instance. Wiki can be added by selecting the Wiki tab on the bottom of the Instance Detail page. Instances with associated VMware VMs will bi-directionally sync VM Essentials Wiki content and VMware VM Notes. See the Wiki Section for more details.

TIP

Markdown Syntax is supported in Wikis.

Library

Subtopics

- Labels
- Automation
- Virtual Images

Labels

Labels are a categorization feature designed to allow easier filtering of list views in the VM Essentials Library. The following library constructs can be labeled:

- Clouds
- Groups
- Tasks
- Instances
- Servers
- Virtual Images

Labels are visible from the list views of any constructs listed above. By default, labels are turned on in the list view but if they aren't showing, click the gear icon (⚙) and then click Labels to enable them.

The list view contains a row of filters above the list, one of which is Labels. Enter a search string to find an existing label or click the dropdown button within the field to select an existing label. This will filter the list to show only constructs which have the selected label.

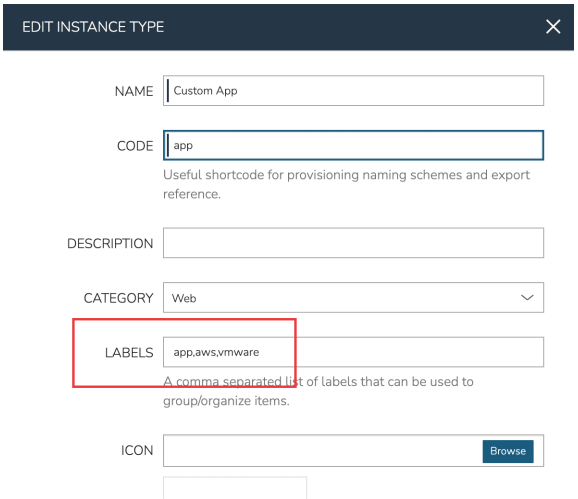
> **NOTE**
> Any list may be filtered by any label which exists on any construct. When a label is removed from a construct and no other constructs also have that label, VM Essentials will remove the label from the list during its nightly sync. It is normal for a label to continue to exist in this list, even if it's not currently applied to any constructs, until the next nightly sync has taken place.

Subtopics

Adding and Removing Labels
Running Automation Against Label Targets

Adding and Removing Labels

Labels can be created when adding or edited any of the supported constructs listed above. When adding or editing the object, enter or edit the comma-separated list of labels you wish to apply.



Running Automation Against Label Targets

Tasks can be run against Instance Labels or Server Labels. When executing the Task, select either Server Label or Instance Label. After specifying the Label, the automation will be run against all Instances or Servers which have the indicated Label. Currently, only one Label may be selected and users cannot enter multiple Labels in the field. If a non-existent Label is entered, the automation simply will not run against any Workloads since the Label does not match any.

NOTE

Instance and server Labels are separate. Even if some Instances or servers have the same Label, the automation is only run against the selected construct (Instance Labels or Server Labels).

Automation

Library > Automation

The automation section is where scripts, known as Tasks, can be created. Tasks are individual Bash or Powershell scripts which can be selected to run against Instances at the time they are provisioned from the Instance provisioning wizard. In this section, users can also create execution schedules which are configured time intervals on which automated jobs (such as backups) would be carried out.

Subtopics

- Tasks
- Execute Scheduling

Tasks

Subtopics

- Role Permissions
- Target Options
- Execute Options
- Source Options
- Allow Custom Config
- Adding Tasks
- Editing Tasks
- Deleting Tasks

Role Permissions

The User Role Permission 'Provisioning: Tasks FULL' is required to create, edit and delete Tasks.

Subtopics

- Common Options

Common Options

When creating a Task, the required and optional inputs will vary significantly by the Task type. However, there are options which are common to Tasks of all types.

Target Options

When creating a Task, users can select a target to perform the execution. Some Task types allow for any of the three execution targets listed below and some will limit the user to two or just one. The table in the next section lists the available execution targets for each Task type.

- **Resource:** A VM Essentials-managed Instance or server is selected to execute the Task
- **Local:** The Task is executed by the VM Essentials appliance node
- **Remote:** The user specifies a remote box which will execute the Task

Execute Options

- **Continue on Error:** When marked, automation stacks including this Task can continue when this Task fails. Additionally, Instances provisioned with this Task as part of its automation stack can be considered provisioned successfully even if this Task has failed
- **Retryable:** When marked, this Task can be configured to be retried in the event of failure
- **Retry Count:** The maximum number of times the Task will be retried when there is a failure
- **Retry Delay:** The length of time (in seconds) VM Essentials will wait to retry the Task
- **Allow Custom Config:** When marked, a text area is provided at Task execution time to allow the user to pass extra variables or specify extra configuration. See the next section for an example.

Source Options

Task configuration code may be entered locally or sourced via URL. Changing the SOURCE type will often update the available fields in the Task modal to accommodate the selected sourcing.

- **Local:** The Task configuration code is written directly in VM Essentials in a large text area. VM Essentials includes syntax highlighting for easier debugging and script writing
- **URL:** For Task configuration that can be source via an outside URL, specify the address in the URL field

Allow Custom Config

When “Allow Custom Config” is marked on a Task, the user is shown a text area for custom configuration when the Task is executed manually from the Tasks List Page. This text area is inside the “Advanced Options” section, which must be expanded in order to reveal the text area. Within the text area, add a JSON map of key-value pairs which can be resolved within your automation scripts. This could be used to pass extra variables that aren’t always needed in the script or for specifying extra configuration.

Subtopics

Example JSON Map:
Task Types
Task Management

Example JSON Map:

```
{"key1": "value1",
"key2": "value2",
"os": "linux",
"foo": "bar"}
```

When the Task is executed, these extra variables would be resolved where called into the script such as in the following simple BASH script example:

```
echo "<%=customOptions.os%>"
echo "<%=customOptions.foo%>"
```

The above example would result in the following output:

```
linux
bar
```

Task Types

Available Task Types

	Task Type	Task Description	Source Options	Execute Target Options	Configuration Requirements	Role Permissions Requirements
	PowerShell Script	Execute PowerShell Script on the Target Resource	Local, Repository, Url	Remote, Resource, Local	None	Library: Tasks
	Restart	Restarts target VM/Host/Container and confirms startup status before executing next task in Workflow	System	Resource	None	Library: Tasks
	Shell Script	Executes Bash script on the target resource	Local, Repository, Url	Local, Remote, Resource	None	Library: Tasks

Task Management

Adding Tasks

Procedure

1. Select Automation from within the Library menu
2. On the Tasks tab, click the Add button
3. From the New Task Wizard input a name for the task
4. Select the type of task from from the type dropdown
5. Input the appropriate configuration details. These will vary based on the selected Task type.
6. Once done, click SAVE CHANGES

Results

TIP

When writing a Task config, it's often necessary to reference VM Essentials variables which pertain to the specific Instance the Task is being run against. VM Essentials includes a pop-out column along the right side of the Add/Edit Task modal which lists available variables. Click and drag the relevant variable into the config area and VM Essentials will automatically fill in the variable call formatted for the currently chosen Task type. See the screenshot below.

TIP

When writing a Task that calls back into the HPE Morpheus VM Essentials API, pass an `Authorization : Execution <%=executionLeaseToken%>` header. The system API will authenticate against that during the life of the Task execution only. This is preferred over other methods of authorizing Task calls as there was a risk of the token expiring in the middle of the Task run.

Editing Tasks

Procedure

1. Select Automation from within the Library menu
2. Click the pencil icon (✎) on the row of the task you wish to edit
3. Modify Task as needed
4. Once done, click SAVE CHANGES

Deleting Tasks

Procedure

1. Select Automation from within the Library menu
2. Click the trash icon ( ) on the row of the Task you wish to delete

Execute Scheduling

Execute Scheduling creates time schedules for automated jobs, such as backups. Backup Jobs are discussed in greater detail in the Backups section and are configured with an execution schedule to coordinate their run times. This section goes through the process of creating and configuring the scheduling object.

Schedules use CRON expressions, such as `0 23 * * 2` equalling `Executes every week on Tuesday at 23:00`. CRON expressions can easily be created by clicking the corresponding translation in the create or edit Execution Schedule modal below the Schedule field and selecting a new value.

NOTE

Execute Schedules CRON expressions should not include seconds or years. The days of the week should be numbered 1-7, beginning with Monday and ending with Sunday. SUN-SAT notation may also be used. For more on writing CRON expressions, many guides are hosted on the Internet including **this one**. VM Essentials execution schedules support most cron syntax but certain more complex expressions may fail to evaluate and the execute schedule will not save. Additionally, some complex expressions may save and work correctly while the friendly written evaluation below the SCHEDULE field is not interpreted correctly. This is due to an issue with the underlying library used to build this feature and cannot easily be resolved at this time.

NAME

Name of the Execution Schedule

NOTE

When assigning Execution Schedules, the name value will appear in the selection drop-down. Using a name that makes clear the time interval is often helpful.

DESCRIPTION

Description of the Execution Schedule for reference in the Execution Schedules list

TIME ZONE

The time zone for execution

Enabled

Check to enable the schedule. Uncheck to disable all associated executions and remove the schedule as an option for Jobs in the future

SCHEDULE

Enter CRON expression for the Execution Schedule, for example `0 0 * * *` equals `Every day at 00:00`

SCHEDULE TRANSLATION

The entered CRON schedule is translated below the SCHEDULE field. Highlighted values can be updated by selecting the value, and relevant options will be presented. The CRON expression will automatically be updated

Virtual Images

Subtopics

- Overview
- Configuring Virtual Images
- Provisioning Images
- Add Virtual Image

Overview

The Virtual Image section displays a list of all images, local and synced, that are available to deploy. VM Essentials includes a rich catalog of pre-configured default images for HVM clusters or for VMware vCenter Cloud targets as well. User Images are automatically synced from Cloud Integrations and added to the Virtual Images section. Images can also be uploaded directly into VM Essentials via local file or url. Understanding the process of prepping images for consumption in VM Essentials is a very important step toward building an effective VM Essentials environment.

IMPORTANT

Invalid Image Settings cause provisioning failures. VM Essentials syncs in as much metadata as possible for synced images, but additional configuration may be needed to ensure successful provisioning.

WARNING

Cloud-init is enabled by default for all Linux images. If your Linux image does not have Cloud-init installed, Cloud-init Enabled must be unchecked before provisioning the image or it will fail immediately.

Configuring Virtual Images

Subtopics

User Images

User Images

Typically VM Essentials does not have sufficient metatdata to successfully provision synced User Images with no additional configuration. After integrating Clouds and User Images have synced, it is highly recommended to configure the images prior to provisioning.

Subtopics

To edit and configure an existing Virtual Image:

To edit and configure an existing Virtual Image:

Procedure

1. Select the pencil icon at the right of any row on the Virtual Images list page, or click EDIT on a Virtual Image detail page.
2. Configure the following on the Image:

Name

Name of the Virtual Image in VM Essentials. This can be changed from the name of the image, but editing will not change the name of the actual image

Operating System

Specifies the platform and OS of the image. All Windows images will need to have the operating system specified on the Virtual Image, as VM Essentials will assign Linux as the platform for all images without an operating system specified

Minimum Memory

The Minimum Memory setting will filter available Service Plan options during provisioning. Service Plans that do not meet the minimum value set on the Virtual Image will not be provided as Service Plan choices

Cloud Init Enabled?

On by default, uncheck for any Image that does not have Cloud-Init or Cloudbase-Init installed

Install Agent?

On by default, uncheck to skip Agent install. Note this will result in the loss of utilization statistics, logs, script execution, and

monitoring. (Some utilization stats are still collected for Agent-less hosts and VMs depending on the cloud)

Username

Existing username on the image. This is required for authentication, unless VM Essentials is able to add user data, Cloud-Init, Cloudbase-Init or Guest Customizations. If Cloud-Init, Cloudbase-Init or Guest Customizations are used, credentials are defined in Administration > Settings > Provisioning and User Settings. If credentials are defined on the image and Cloud-Init is enabled, VM Essentials will add that user during provisioning, so ensure that user does not already exist on the image (such as `root`). For Windows Guest Customizations, VM Essentials will set the Administrator password to what is defined on the image if Administrator user is defined. Do not define any other user than Administrator for Windows Images unless using Cloudbase-init. VM Essentials recommends running Guest Customizations for all Windows Images, which is required when joining Domains as the SID will change

Password

Password for the user on the image if username is populated

Bucket

Location where the Virtual Image will be stored. Default Virtual Image Storage location is `/var/opt/morpheus/morpheus-ui/vms`. Additional Storage Providers can be configured in Infrastructure > Storage

Cloud-Init User Data

Accepts what would go in `runcmd` and can assume Bash syntax. Example use: Script to configure satellite registration at provision time

Create Image ID

Select FILE to browse locally for an image or drop an image file into the dropzone. Alternatively, select URL to download the image from an accessible URL. It is recommend to configure the rest of the settings below prior to uploading the source Image File(s)

Permissions

Set Tenant permissions in a multi-tenant VM Essentials environment. Select private visibility and select specific Tenants to which the Virtual Image will be made available. Select public visibility to share the Virtual Image with all Tenants

Auto Join Domain?

Enable to have Instances provisioned with this image auto-join configured domains (Windows only, domain controller must be configured in Infrastructure > Network and the configured domain set on the provisioned to Cloud or Network)

VirtIO Drivers Loaded?

Enable if VirtIO Drivers are installed on the image for provisioning to KVM-based hypervisors

FIPS Compliant Image?

When selected, VM Essentials will install the FIPS-compliant VM Essentials Agent package

VM Tools Installed?

On by default, uncheck if VMware Tools (including OpenVMTools) are not installed on the Virtual Image. VM Essentials will skip network wait during provisioning when deselected

Force Guest Customization?

VMware only, forces guest customizations to run during provisioning, typically when provisioning to a DHCP network where guest customizations would not run by default. This options requires that VMware Tools is installed on the image

Trial Version

Enable to automatically re-arm the expiration on Windows Trial Images during provisioning

Enabled Sysprep?

Applicable to VMware vCenter Clouds. Enable if the Windows Image has been sysprepped. If enabled, VM Essentials will inject `unattend.xml`

3. Click Save Changes

> **NOTE**
>
> Cloud-Init is enabled by default on all images. Images without Cloud-Init or Cloudbase-Init installed must have the `cloud-init` flag disabled on the Virtual Image setting or Provisioning may fail.

> **IMPORTANT**
>
> VM Essentials does not validate or restrict image uploads to certain file types and any type of file may be uploaded as a Virtual Image. For security purposes, these files are stored in a non-executable state so users need not worry about potentially dangerous file types being uploaded (ex. executables).

Provisioning Images

When provisioning a system image, VM Essentials will stream the image from Amazon S3 to the target Cloud if the image is not local to the Cloud.

When using images that already exist in the destination Cloud, such as synced or previously copied images, no image stream from S3 through the VM Essentials Appliance to the destination cloud will take place.

> **NOTE**
>
> The VM Essentials Appliance must be able to download from Amazon S3 when provisioning system images.

> **NOTE**
>
> The VM Essentials Appliance must be able reach and resolve the destination Host when provisioning System Images or uploaded Images for the first time. This included being able to resolve ESXi host names in VMware vCenter clouds, and reach the destination ESXi host over port 443.

Add Virtual Image

About this task

Virtual Images can be uploaded to VM Essentials from local files or URLs.

> **WARNING**
>
> Be conscious of your Storage Provider selection. The default Storage Provider is the VM Essentials Appliance at `/var/opt/morpheus/morpheus-ui/vms`. Uploading large images to the VM Essentials Appliance when there is inadequate space will cause upload failures and impact Appliance functionality. Ensure there is adequate space on your selected Storage Provider. Additional Storage Provider can be added at Infrastructure > Storage, which can be configured as the default Virtual Image Store or selected when uploading Images.

> **NOTE**
>
> VMware-type OVF Virtual Images do not support mounted ISO uploads

To Add Virtual Image:

Procedure

1. Select + Add in the Virtual Images page.
2. Select Image format:
   - ISO
   - QCOW2
   - RAW
   - VMware (vmdk/ovf/ova)
3. Configure the following on the Virtual Image:

   Name

   Name of the Virtual Image in VM Essentials. This can be changed from the name of the image, but editing will not change the name of the actual image

   Operating System

   Specifies the platform and OS of the image. All Windows images will need to have the operating system specified on the Virtual Image, as VM Essentials will assign Linux as the platform for all images without an operating system specified

   Minimum Memory

   The Minimum Memory setting will filter available Service Plan options during provisioning. Service Plans that do not meet the minimum value set on the Virtual Image will not be provided as Service Plan choices

   Cloud Init Enabled?

   On by default, uncheck for any Image that does not have Cloud-Init or Cloudbase-Init installed

   Install Agent?

   On by default, uncheck to skip Agent install. Note this will result in the loss of utilization statistics, logs, script execution, and monitoring. (Some utilization stats are still collected for Agent-less hosts and VMs depending on the cloud)

   Username

   Existing username on the image. This is required for authentication, unless VM Essentials is able to add user data, Cloud-Init, Cloudbase-Init or Guest Customizations. If Cloud-Init, Cloudbase-Init or Guest Customizations are used, credentials are defined in Administration > Settings > Provisioning and User Settings. If credentials are defined on the image and Cloud-Init is enabled, VM Essentials will add that user during provisioning, so ensure that user does not already exist on the image (such as `root`). For Windows Guest Customizations, VM Essentials will set the Administrator password to what is defined on the image if Administrator user is defined. Do not define any other user than Administrator for Windows Images unless using Cloudbase-init. VM Essentials recommends running Guest Customizations for all Windows Images, which is required when joining Domains as the SID will change

   Password

   Password for the user on the image if username is populated

   Bucket

   Location where the Virtual Image will be stored. Default Virtual Image Storage location is `/var/opt/morpheus/morpheus-ui/vms`. Additional Storage Providers can be configured in Infrastructure > Storage

   Cloud-Init User Data

   Accepts what would go in `runcmd` and can assume Bash syntax. Example use: Script to configure satellite registration at provision time

Create Image ID

Select FILE to browse locally for an image or drop an image file into the dropzone. Alternatively, select URL to download the image from an accessible URL. It is recommend to configure the rest of the settings below prior to uploading the source Image File(s)

Permissions

Set Tenant permissions in a multi-tenant VM Essentials environment. Select private visibility and select specific Tenants to which the Virtual Image will be made available. Select public visibility to share the Virtual Image with all Tenants

Auto Join Domain?

Enable to have Instances provisioned with this image auto-join configured domains (Windows only, domain controller must be configured in Infrastructure > Network and the configured domain set on the provisioned to Cloud or Network)

VirtIO Drivers Loaded?

Enable if VirtIO Drivers are installed on the image for provisioning to KVM-based hypervisors

FIPS Compliant Image?

When selected, VM Essentials will install the FIPS-compliant VM Essentials Agent package

VM Tools Installed?

On by default, uncheck if VMware Tools (including OpenVMTools) are not installed on the Virtual Image. VM Essentials will skip network wait during provisioning when deselected

Force Guest Customization?

VMware only, forces guest customizations to run during provisioning, typically when provisioning to a DHCP network where guest customizations would not run by default. This options requires that VMware Tools is installed on the image

Trial Version

Enable to automatically re-arm the expiration on Windows Trial Images during provisioning

Enabled Sysprep?

Applicable to VMware vCenter Clouds. Enable if the Windows Image has been sysprepped. If enabled, VM Essentials will inject `unattend.xml`

NOTE

Default Storage location is `/var/opt/morpheus/morpheus-ui/vms`. Additional Storage Providers can be configured in Infrastructure > Storage. Ensure local folders are owned by morpheus-app.morpheus-app if used.

WARNING

Provisioning will fail if Cloud init Enabled is checked and Cloud-Init is not installed on the Image.

NOTE

Existing Image credentials are required for Linux Images that are not Cloud-Init enabled and for Windows Images when Guest Customizations are not used. Cloud-Init and Windows user settings need to be configured in Administration > Settings > Provisioning when using Cloud-Init or Guest Customizations and new credentials are not set on the Virtual Image.

4.

Upload Image

Images can be uploaded by File or URL:

File

Drag and Drop the image file, or select Add File to select the image file.

Url

Select the URL radio button, and enter URL of the Image.

NOTE

The Virtual Image configuration can be saved when using a URL and the upload will finish in the background. When selecting/drag and dropping a file, the image files must upload completely before saving the Virtual Image record or the Image will not be valid.

5. Save Changes.

Subtopics

VMware - VM Templates Copies

VMware - VM Templates Copies

In a VMware environment, you may have a single VM template that you use across different vCenters. Uploading an image to VM Essentials, mentioned in the Add Virtual Image section, is one method to solve this. Alternatively, an organization may decide to create a VM template in one vCenter and then transfer it to other vCenters, which then could be synced into VM Essentials.

If all the vCenters are added as Clouds into VM Essentials and the templates are named the same in each vCenter, they will be aggregated under a single virtual image in VM Essentials. This means that as you deploy to the various vCenter Clouds in VM Essentials using this virtual image, it will choose the correct VM template to use based on the Cloud deployed to.

VM Essentials supports VMware Content Libraries storing VM templates and syncing into VM Essentials, the same as a template in a folder. Additionally, the Content Library can be used to house the same template in multiple libraries. If they have the same name, these templates will be aggregated under a single virtual image. If the Content Library is stored on a datastore that the target host/cluster has access to, it will use that library first, to reduce the cloning time. If the Content Library is not stored in a datastore accessible by the cluster/host, a copy of the VM template will be performed to the target host/cluster instead.

NOTE

VM templates are a **Datacenter** level object. The same process above applies to a single VMware cloud with multiple logical datacenters. It will not apply to clusters, as a template is not associated with a cluster, only when it is converted to a VM.

Infrastructure

The heart of VM Essentials is the ability to manage provisioning across any infrastructure, from bare metal to virtualized clouds and all the way to public infrastructure.

Subtopics

Groups
Clouds
Clusters
Network

Storage
Trust

Groups

Subtopics

Overview
UI
CLI
API
Adding Groups
Managing Groups
Edit Group
Delete Group
User Access

Overview

About this task

Groups in VM Essentials define the available resources for each user. Group access is defined by Roles. Clouds are added to Groups, and a User can only access the Clouds associated with Groups in their Role. Resources such as networks, datastores, resource pools, and folders have additional Group access settings.

The Groups list page displays all current groups, which can be filtered by applied Labels or by simple search. Existing Groups can be edited here and new Groups can be created.

To View Groups:

Procedure

1. Hover over the Infrastructure link in the menu bar
2. Click the Groups link

UI

1. Select the Infrastructure link in the navigation bar
2. Click the Groups link

CLI

To view all groups: `groups list`. To use the group: `groups use <id>` or `groups use "group name"` To get a JSON output of a specific group: `groups get <id> -j` or `groups get "group name" -j`

API

API

To view all groups: `curl https://api.gomorpheus.com/api/groups -H "Authorization: BEARER access_token"` To view a specific group: `curl https://api.gomorpheus.com/api/groups/:id -H "Authorization: BEARER access_token"`

Adding Groups

About this task

To add a group:

Procedure

1. Select the Infrastructure link in the navigation bar
2. Click the Groups link
3. Click the Create Group button
4. Input out the Name and Location (optional) fields
5. Click the Save Changes button to save

Managing Groups

About this task

To view a Group:

Procedure

1. Select the Infrastructure link in the navigation bar
2. Click the Groups link
3. Click the Group name to view/modify

Results

Available tabs in group view

Hosts

: Lists available hosts in the group and displays power, os, name, type, cloud, ip address, nodes, disc space, memory, and status. You can add a host from this tab panel by clicking Add Host.

Virtual Machines

: List all Virtual Machines in the Group.

Bare Metal

: List all Bare Metal Hosts added to the Group

Clouds

: Lists Clouds added to the Group. Existing Clouds or new Clouds can be added from the Group by clicking Add Cloud.

Wiki

: Provides a text area for entering wiki content related to the Group in Markdown format. Additional information on Wiki is available in the Operations_>_Wiki documentation section

Edit Group

About this task

To edit a Group:

Procedure

1. Select the Infrastructure link in the navigation bar.
2. Click the Groups link.
3. Click the name of the group you wish to edit.
4. Click the Edit button.
5. From the Edit Group Wizard modify information as needed.
6. Click the Save Changes button to save.

Delete Group

About this task

To delete a Group:

Procedure

1. Select the Infrastructure link in the navigation bar.
2. Click the Groups link.
3. Click the name of the group you wish to delete.
4. Click the Delete button.
5. Confirm

User Access

IMPORTANT

User access to Groups is determined by their Role(s). Group access for Roles can be configured in the Group Access section of a Role's Settings.

Clouds

Subtopics

Overview

Creating Clouds
Cloud Detail View
Deleting Clouds

Overview

In VM Essentials, a Cloud represents a grouping of HVM clusters (referred to as a “Private Cloud”) or an integration with a VMware vCenter appliance. This section describes general information about the Clouds construct and UI pages for Clouds. See the VMware integration guide for more specific details on integrating with VMware and the features supported by VM Essentials.

Creating Clouds

Clouds can be added from Infrastructure > Clouds or in Infrastructure > Groups > (selected Group) > Clouds. A more detailed guide to adding a VMware vCenter Cloud can be found in the vCenter integration guide. The other available Cloud type, known as Private Cloud, is a generic Cloud type that doesn’t directly integrate with any other technology as the vCenter Cloud type does. Instead Private Cloud-type Clouds are used to house your HVM clusters. Make as many Private Cloud-type Clouds as needed to organize your HVM clusters properly.

Cloud Detail View

The Cloud Detail view shows metrics on health, sync status, resource utilization statistics, and resource counts for hosts, virtual machines, or any other constructs under the umbrella of the selected Cloud.

From the Cloud list page, select the name of a Cloud to display that Cloud’s detail page. You’ll notice the following actions are available:

EDIT

Edit the setup configuration of the Cloud.

REFRESH

Force a sync with the Cloud.

DELETE

Delete the Cloud from VM Essentials.

IMPORTANT

All Instances, managed Hosts, and VMs associated with the Cloud must be removed prior to deleting a Cloud.

Subtopics

Cloud Detail Tabs

Cloud Detail Tabs

NOTE

Not all tabs are available for all Cloud Types.

Clusters

The Clusters tab displays clusters provisioned into the Cloud being viewed, including their status, type, name, layout, workers, and compute, memory, and storage stats. You can add a cluster by clicking ADD CLUSTER.

Hosts

The Hosts tab displays available hosts in the Cloud and displays power, OS, name, type, cloud, IP address, nodes, disk space, memory, and status. You can add a resource by clicking ADD RESOURCE, add a hypervisor host by clicking ADD HYPERVISOR, or perform action an action by selecting one or more Hosts and clicking ACTIONS.

VMs

Displays an inventory of existing Instances in your Cloud configuration and provides details such as power, OS, name, type, cloud, IP address, nodes, disk space, memory, and status.

Bare Metal

Setup PXE Boot in the Boot section to add bare metal servers. Once set up you can view information such as power, OS, name, type, cloud, IP address, nodes, disk space, memory, and status.

Security Groups

The Security Groups tab displays a list of existing security groups in the cloud. You can add a security group to this cloud by clicking EDIT SECURITY GROUPS.

Networks

Displays Networks synced or added to the Cloud, including their name, type, CIDR, pool, DHCP status, visibility and targeted Tenant.

Data Stores

Displays Datastores synced or added to the Cloud, including their name, type, capacity, online status, visibility, and targeted Tenant.

Resources

Displays Resource Pools synced from the Cloud, including their name, description, and targeted Tenant.

Deleting Clouds

About this task

To delete a Cloud:

Procedure

1. Select the Infrastructure link in the navigation bar.
2. Select the Clouds link in the sub navigation bar.
3. Click the Delete icon of the cloud to delete.

Results

IMPORTANT

All Instances, managed Hosts and VMs must be removed prior to deleting a Cloud.

Clusters

Subtopics

Overview
Requirements

Cluster Permissions
HVM clusters

Overview

The Infrastructure > Clusters section is where the list of existing HVM clusters can be viewed. Here you can view high-level statistics about all clusters under management by VM Essentials manager, such as aggregate resource usage by all clusters and the number of workloads running across all of them. Click into an existing HVM cluster to view additional metrics such as hosts, VMs, resource utilization by the host, and a lot more.

Requirements

- VM Essentials Role permission Infrastructure: Clusters > Full required for Viewing, Creating, Editing and Deleting Clusters
- VM Essentials Role permission Infrastructure: Clusters > Read required for Viewing Cluster list and detail pages

Cluster Permissions

- Cluster Permissions

  Each Cluster has Group and Service Plan access permissions settings (Gear icon > Permissionsfrom the Clusters list page)

HVM clusters

An HVM cluster is a hypervisor clustering technology utilizing KVM. Beginning with just a few basic Ubuntu boxes, VM Essentials can create a cluster of HVM hypervisor hosts complete with monitoring, failover, easy migration of workloads across the cluster, and zero-downtime maintenance access to hypervisor host nodes. All of this is backed by a highly-granular RBAC engine, and image library with automation stacks.

Subtopics

Features
Base Cluster Details
Provisioning the Cluster
HVM Cluster Networking
Provisioning a Workload
Monitoring the Cluster
Image Prep (Windows)
Utilizing Existing QCOW Images from an NFS File Share
Hardware Passthrough

Features

Subtopics

Host Features
VM Features

Host Features

- Automated HVM cluster provisioning
- DRS, automatic rebalancing of clusters based on resource consumption
- Compatibility validation of network and storage devices at time of cluster provisioning
- Hypervisor console
- Configuration and deployment of OVS networks (VLANs)
- Cluster and individual host monitoring
- Add hosts to existing clusters
- Console support for cluster hosts
- Add, edit and remove networks and datastores from clusters
- Gracefully take hosts out of service with maintenance mode
- Migration of workloads across hosts
- Configurable automatic failover of running workloads when a host is lost
- Ability to add and provision to fibre channel storage resources or iSCSI storage resources via GFS2 filesystem
- Governance through VM Essentials RBAC
- Pass host-attached NVME, USB, and GPU hardware through to VMs running on the host

VM Features

- Workload provisioning and monitoring (Linux or Windows workloads)
- Console support for running workloads
- Affinity placement, pin VMs to hosts
- Brownfield discovery of existing VMs
- Reconfigure VM sizing
- Disk migration across datastores
- UEFI support
- Migration of VMs across hosts
- Configure automatic failover for individual VMs in the event a host is lost
- Reconfigure running workloads to resize plan, add/remove disks, and add/remove network interfaces
- Backup and restore VM workloads, with optional synthetic full backups
- Clone VMs
- Take snapshots and revert to snapshots

- VM Essentials library and automation support
- Claim and consume host-attached NVME, USB, and GPU hardware to run hardware-accelerated workloads on VMs

Base Cluster Details

An HVM cluster using the hyperconverged infrastructure (HCI) Layout consists of at least three hosts. Physical hosts are recommended to experience full performance of the solution. In smaller environments, it is possible to create an HVM cluster with three nested virtual machines, a single physical host (non-HCI only), or a single nested virtual machine (non-HCI only) though performance may be reduced. With just one host it won't be possible to migrate workloads between hosts or take advantage of automatic failover. Currently, the default cluster layout requires hosts be a pre-existing Ubuntu 24.04 box with environment and host system requirements described in this section. An earlier cluster layout requiring Ubuntu 22.04 is also included. VM Essentials handles cluster configuration by providing the IP address(es) for your host(s) and a few other details. Details on adding the cluster to VM Essentials are contained in the next section.

Subtopics

Hardware Requirements
Example Cluster Deployment

Hardware Requirements

- **Operating System:** Ubuntu 24.04 or Ubuntu 22.04
- **CPU:** One or more 64-bit x86 CPUs, 1.5 GHz minimum with Intel VT or AMD-V enabled
- **Memory:** 4 GB minimum. For non-converged Layouts, configure HVM hosts to use shared external storage, such as an NFS share or iSCSI target.
- **Disk Space:** For converged storage, a data disk of at least 500 GB is required for testing. More storage will be needed for production clusters. An operating system disk of 15 GB is also required. Clusters utilizing non-converged Layouts can configure external storage (NFS, etc.).
- **Network Connectivity:** HVM hosts must be assigned static IP addresses. They also need DNS resolution of the VM Essentials appliance and Internet access in order to download and install system packages for dependencies, such as KVM, Open vSwitch (OVS), and more

NOTE

Ubuntu 22.04 uses `netplan` for networking and it is the responsibility of the customer to establish recommended networking configurations prior to provisioning an HVM cluster. To configure a static IP address, change into the directory holding the config files (`cd /etc/netplan`) and edit the existing configuration file (`/etc/netplan/50-cloud-init.yaml` or `/etc/netplan/00-installer-config.yaml` or `/etc/netplan/01-netcfg.yaml`). If desired, backup the existing configuration prior to editing it (`cp /etc/netplan/<file-name>.yaml /etc/netplan/<file-name>.yaml.bak`). For additional information on configuration file formatting, refer to `netplan` **documentation**. Once the configuration is updated, validate and apply it (`netplan try`). The `try` command will validate the configuration and apply it if it's valid. If invalid, it will automatically be rolled back.

NOTE

Clustered storage needs as much network bandwidth as possible. Network interfaces of at least 10 Gbps with jumbo frames enabled are required for clustered storage and for situations when all traffic is running through the management interface (when no compute or storage interface is configured). It's highly likely that performance will be unacceptable with any lower configurations.

Table 1. Network Communication Ports

Description	Source	Destination	Port	Protocol
VM Essentials Agent communication with the VM Essentials appliance	HVM host	VM Essentials appliance server	443	TCP
HVM host configuration and management	VM Essentials appliance server	HVM host	22	TCP
Inter-host communication for clustered deployments	HVM host	HVM host	22	TCP
VM Essentials server SSH access for deployed virtual machines	VM Essentials appliance server	Hosted virtual machines	22	TCP
VM Essentials server WinRM (HTTP) access for deployed virtual machines	VM Essentials appliance server	Hosted virtual machines	5985	TCP
VM Essentials server WinRM (HTTPS) access for deployed virtual machines	VM Essentials appliance server	Hosted virtual machines	5986	TCP

Example Cluster Deployment

In this example cluster, each host box consists of:

- 4 vCPU
- 16 GB memory
- 20 GB OS boot disk
- 250 GB data disk (deployed to `/dev/sdb`)
- 3 network interfaces for management, storage, and compute traffic (set to `eth0`, `eth1`, and `eth2`, respectively, in this example. Your environment may differ.)

NOTE

250 GB data disks used in this example are simply for demonstration purposes. A typical test cluster should consist of at least 500 GB storage and more will be required for production. Do not raid disks on physical servers. Multiple disks may be specified per host by giving a comma-separated list (ex. /dev/sda,/dev/sdb,/dev/sdc,etc.) in the DATA DEVICE field during cluster setup. These along with disks from all other nodes will be added to the total storage, which is presented as one large volume.

HVM clusters must also live in Private Cloud-type Clouds (See Infrastructure > Clouds). A pre-existing Cloud may be used or a new Cloud could be created to house HVM clusters.

Provisioning the Cluster

As mentioned in the previous section, HVM hosts should be running Ubuntu 24.04 to use the latest HVM cluster layout (version 1.2+). HVM hosts running Ubuntu 22.04 can also be used (select HVM cluster layout 1.1). I also have a Private Cloud-type Cloud to house the cluster. Begin the cluster creation process from the Clusters list page (Infrastructure > Clusters). Click + ADD CLUSTER and select "HVM".

VM Essentials gives the option to select a hyperconverged infrastructure (HCI) **LAYOUT** or non-HCI. In this example, the HCI Layout is used (requires a three-node minimum). Next, configure the names and IP addresses for the host boxes (**SSH HOST**). The SSH HOST name configuration is simply a display name in VM Essentials, it does not need to be a hostname. By default, configuration space is given for three hosts which is what this example cluster will have. You must at least configure one and it's possible to add more by clicking the (+) button. The **SSH PORT** is pre-configured for port 22, change this value if applicable in your environment. Next, set a pre-existing user on the host boxes (**SSH USERNAME** and **SSH PASSWORD**) and **SSH KEY**. Use a regular user with sudo access.

In the next part of the modal, you'll configure the storage devices and network interfaces. Find your disk name, if needed, with the `lsblk` command. In my case, the target device is located at `/dev/sdb`.

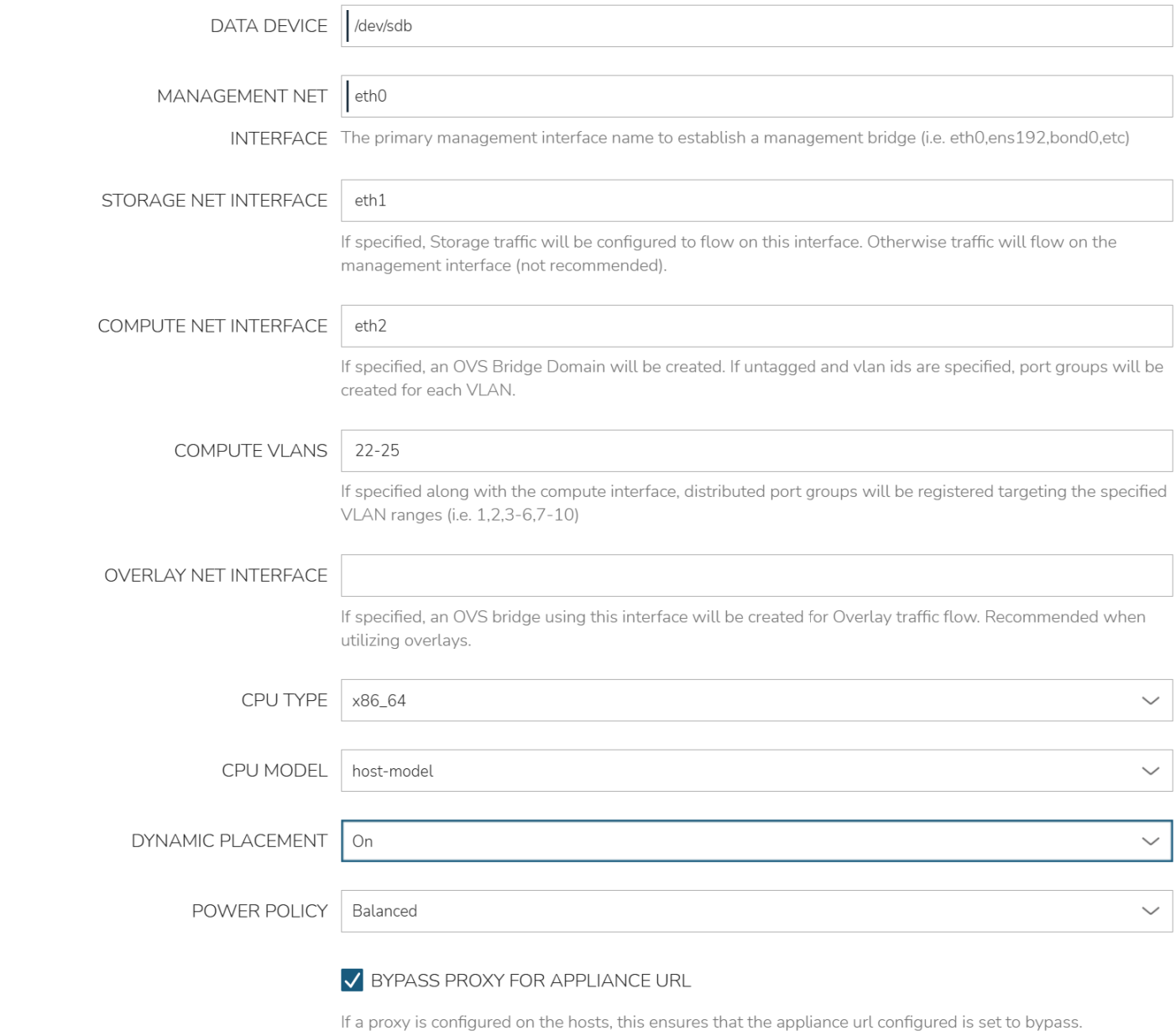
Though not strictly required, it's recommended to have separate network interfaces to handle cluster management, storage traffic, and compute. In this example case, `eth0` is configured as the **MANAGEMENT NET INTERFACE** which handles communication between the cluster hosts. `eth1` is configured as the **STORAGE NET INTERFACE** and `eth2` is configured as the **COMPUTE NET INTERFACE**. The **COMPUTE VLANS** field can take a single value (ex. 1) or a range of values (ex. 22-25). This will create OVS port group(s) selectable as networks when provisioning workloads to the cluster. If needed, you can find your network interface names with the `ip a` command.

Next, only one **CPU TYPE** is currently supported (`x86_64`) though this may change in the future. For **CPU MODEL** configuration, we surface the entire database of model configurations from `libvirt`. If unsure or if you don't know of a specific reason to choose one or the other, select `host-passthrough` which is the default option.

Finally, select a **DYNAMIC PLACEMENT** and **POWER POLICY**configuration. When enabled, Dynamic Placement will automatically balance VMs across cluster hosts based on resource utilization. When disabled, VMs will only migrate to a new host if they are pinned to a specific host or failed over and not running on the preferred host. With Power Policy, set Balanced (default) or Performance configuration. Balanced optimizes for a mix of performance and efficiency. Performance mode is optimized for scenarios requiring maximum performance. It reduces network latency by applying configurations similar to the `tuned` "network-latency" profile and switches CPUs into performance mode.

NOTE

Power Policy settings require Agent version 3.0.0+ running on the HVM Host and take effect following the next sync cycle. You can upgrade HVM Host Agents by navigating to the Host detail page, opening the ACTIONS menu, and selecting Upgrade Agent. Alternatively, you can select Download Agent Script to download a script which can be run on the HVM Host to upgrade its Agent version. Download scripts are specific to the HVM Host so you will need an individual script per HVM Host. Power Policy settings will persist following a HVM Host reboot.


DATA DEVICE
/dev/sdb
MANAGEMENT NET
eth0
INTERFACE
The primary management interface name to establish a management bridge (i.e. eth0,ens192,bond0,etc)
STORAGE NET INTERFACE
eth1
If specified, Storage traffic will be configured to flow on this interface. Otherwise traffic will flow on the management interface (not recommended).
COMPUTE NET INTERFACE
eth2
If specified, an OVS Bridge Domain will be created. If untagged and vlan ids are specified, port groups will be created for each VLAN.
COMPUTE VLANS
22-25
If specified along with the compute interface, distributed port groups will be registered targeting the specified VLAN ranges (i.e. 1,2,3-6,7-10)
OVERLAY NET INTERFACE
If specified, an OVS bridge using this interface will be created for Overlay traffic flow. Recommended when utilizing overlays.
CPU TYPE
x86_64
CPU MODEL
host-model
DYNAMIC PLACEMENT
On
POWER POLICY
Balanced
BYPASS PROXY FOR APPLIANCE URL
If a proxy is configured on the hosts, this ensures that the appliance url configured is set to bypass.

At this point we've kicked off the process for configuring the cluster nodes. Drill into the Cluster detail page and click on the History tab. Here we can monitor the progress of configuring the cluster. HPE Morpheus VM Essentials will run scripts to install KVM, install OVS, and to prepare the cluster. In just a short time, the cluster provisioning should complete and the cluster will be ready to deploy workloads.

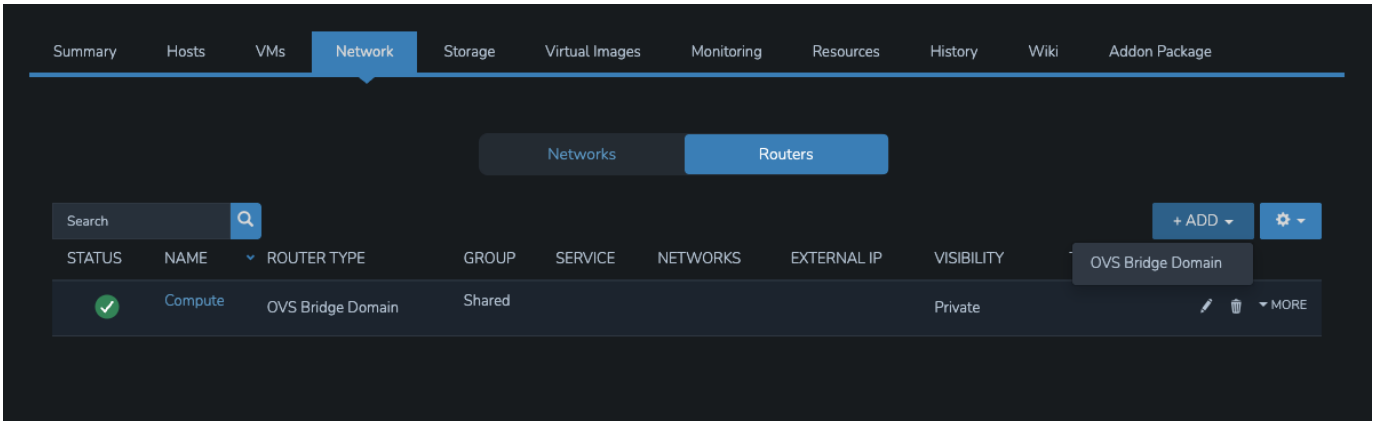
HVM Cluster Networking

On initial cluster provisioning, OVS bridges and Libvirt Networks are created and are immediately ready for VM provisioning. However, when adding new network interfaces, you may need to create networking objects in the UI manually. Currently, the HPE Morpheus VM Essentials Software Manager does not discover new interfaces that are not in netplan. You'll need to ensure they are in the `01-base.yml` netplan file, apply it, create the bonds in the `hpe-vm` tool, and then refresh the HVM Cluster via the UI. See the installation section at the beginning of this documentation repository for more information on the `hpe-vm` tool and its use.

HVM network objects are created from the Network tab of the HVM Cluster detail page (Infrastructure > Clusters, then select the HVM Cluster). Two subtabs are shown here for Routers and Networks. From a KVM perspective, OVS Bridges and Libvirt Networks (without any port groups) are created on the Routers subtab. Port Group entries are added to existing Libvirt Networks on the Networks subtab. For this reason, it's often most logical to begin creating new HVM network objects on the Routers subtab before moving onto the Networks subtab. For a higher level discussion and diagram of recommended HVM Cluster network topology and to see where these objects fit in, refer back to the example network configurations in the "Getting Started" section of this user manual.

Adding Routers

1. From the Routers subtab, click + ADD, then select OVS Bridge Domain



2. On the ADD NETWORK ROUTER modal, configure the following:

   a. **GROUP:** Select "Shared" to make the router object available to all Groups or select an individual Group

   b. **NAME:** A name for the router object in HPE Morpheus VM Essentials Software

   c. **HOST BRIDGE:** Select an existing OVS bridge or choose "Create New"

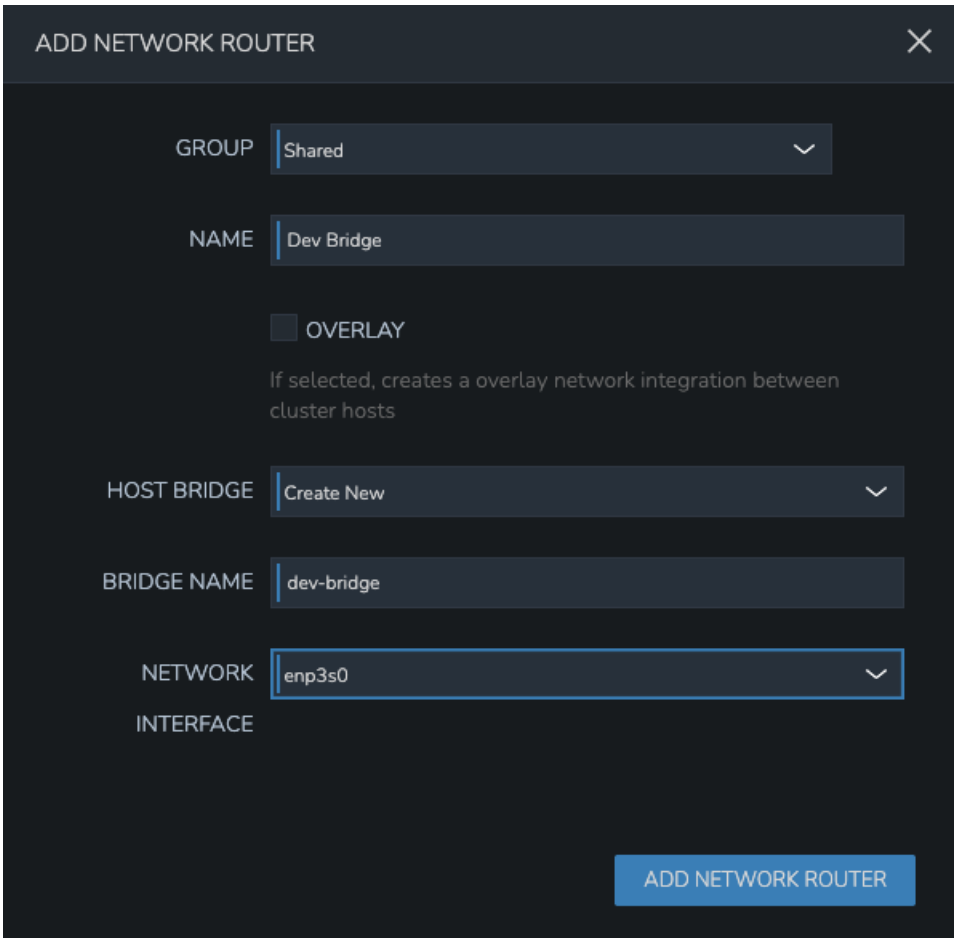
   d. **BRIDGE NAME:** Shown only when opting to create a new Host Bridge. Provide a name for the new OVS bridge to be created. The bridge name value entered here will be used to identify the bridge throughout the UI while examining the created objects via a terminal session connected to the Host will show it identified by the interface name

   e. **NETWORK INTERFACE:** Shown only when opting to create a new Host Bridge. Select a network interface for the new OVS bridge. Keep in mind that currently new interfaces are not discovered automatically. See the opening paragraph of this section for more information on surfacing the new interface to the HVM Cluster

   NOTE

   By adding a router here and selecting an existing OVS bridge, a new Libvirt Network is created without any port groups but no new OVS bridge is created. When selecting "Create New" in the Host Bridge configuration field, a new OVS bridge is created and a new Libvirt Network is also created without any port groups. A free physical interface or bond must be available to create a new OVS bridge and currently these are not automatically discovered by the HVM Cluster. See the opening paragraph of this section for more information on surfacing new interfaces to the HVM Cluster. Libvirt Port Groups are created in the next section on adding networks. For a higher level discussion and diagram of recommended HVM Cluster network topology and to see where these objects fit in, refer back to the example network configurations in the "Getting Started" section of this user manual.

3. Click ADD NETWORK ROUTER

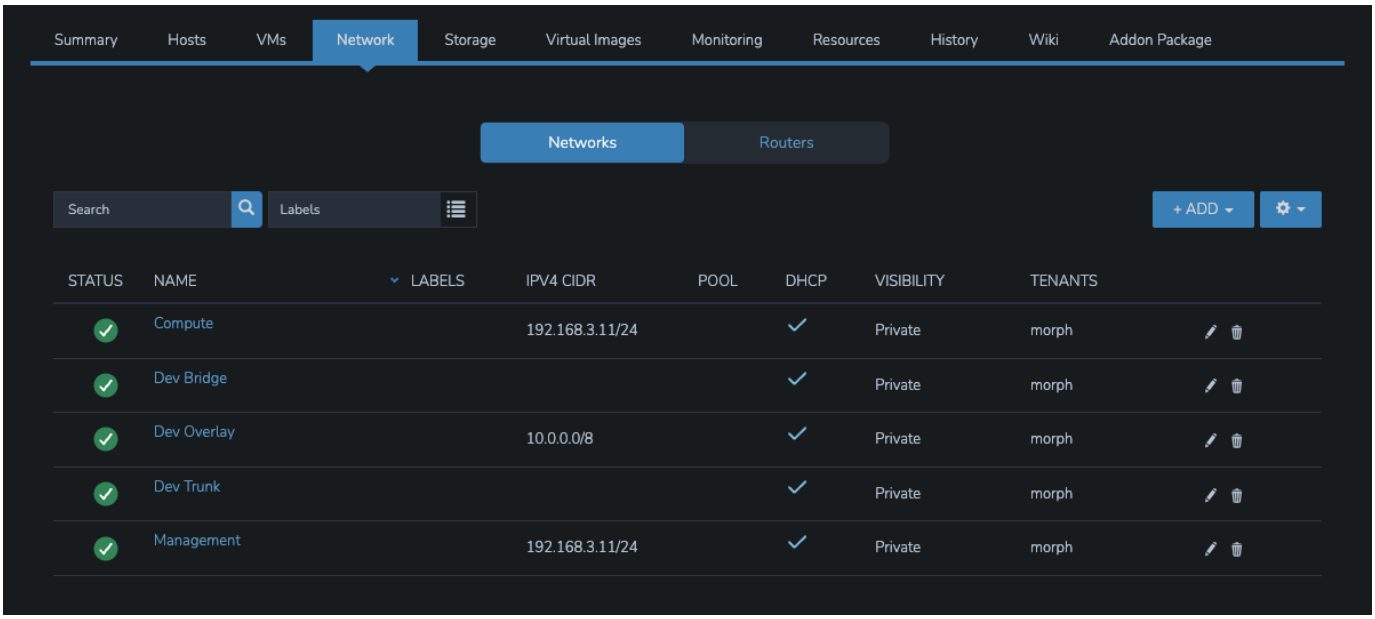


Once saved, the router object is created and it appears in the list of current routers.

Adding Networks

As mentioned in the previous section, creating network objects on HVM clusters is akin to adding Libvirt Portgroups to an existing Libvirt Network. If continuing from the previous section on adding routers, the OVS bridges and Libvirt networks will be in place to add port groups (referred to as networks here in the UI).

1. From the Networks subtab, click + ADD, then select OVS Port Group



2. On the CREATE NETWORK modal, configure the following:

a. **GROUP:** Select "Shared" to make the router object available to all Groups or select an individual Group

b. **NAME:** A name for the network object in HPE Morpheus VM Essentials Software

c. **CIDR:** The CIDR range for the new network

d. **GATEWAY:** The network gateway address

e. **DNS PRIMARY:** The address for the primary DNS server

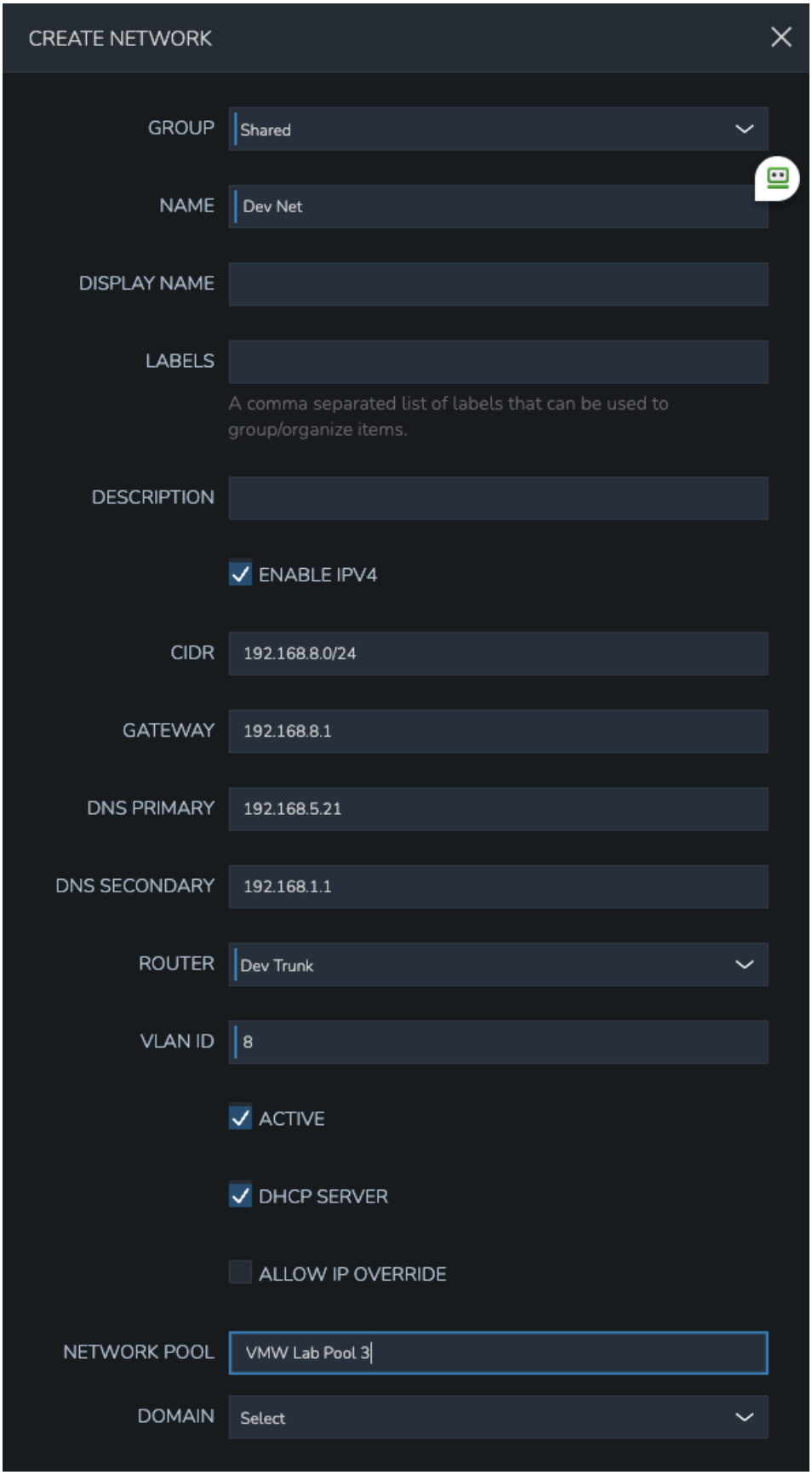
f. **DNS SECONDARY:** The address for the secondary DNS server

g. **ROUTER:** Select an existing OVS bridge. If you need to create a new OVS bridge, add a new "OVS Bridge Domain" from the Routers subtab (described above) and select "Create New" for it's "Host Bridge" field configuration. Additional details on router objects are provided above.

h. **VLAN ID:** A VLAN ID for the Libvirt Port Group to be created

i. **NETWORK POOL:** A typeahead field for selecting a currently-configured IP Pool

3. Click SAVE CHANGES



Provisioning a Workload

At this point, the cluster is ready for workloads to be provisioned to it. Within the Instance provisioning wizard (See Provisioning > Instances

documentation for more details on provisioning), there is now the “HVM” Instance Type. This Instance will allow you to choose from any HVM cluster-compatible images within your environment. Out of the box, VM Essentials does not include any compatible images but there is a section later in this guide covering the process of onboarding existing QCOW images into the UI as Virtual Images and another section covering the process of prepping Windows images from the downloaded ISO.

After arriving at the Configure tab of the provisioning wizard, select a Plan based on resource needs. From the **RESOURCE POOL** field, select the desired HVM cluster. When configuring **VOLUMES** for the new workload, note that space can be claimed from the configured volume. Within **NETWORKS**, we can add the new workload to one of the **VLANS** set up as part of cluster creation. Finally, note that we can choose the HOST the workload should run on in addition to selecting the compatible image.

TIP

The VOLUMES configuration within the provisioning wizard includes a flyout menu allowing storage type (standard, thin, thick (lazy zero), and thick (eager) and storage profile (cache: none or cache: directsync) configurations to be set on each individual volume.

Review and complete the provisioning wizard. After a short time, the workload should be up and running. With a workload now running on the cluster, we can take a look at some of the monitoring, migration, failover, and other actions we can take for workloads running on HVM clusters.

NOTE

HVM clusters support CPU pinning (tying specific vCPUs associated with running workloads to specific physical CPU cores). Currently, this must be done manually by accessing the appropriate HVM host and issuing `virsh` commands or editing XML. Adding UI tools to view and control CPU pinning is on the product roadmap to be added in the near future. Despite the requirement to edit CPU pinning manually, this is a supported action for workloads running on HVM clusters.

Monitoring the Cluster

With the server provisioned and a workload running, take a look at the monitoring and actions capabilities on the cluster detail page (Infrastructure > Clusters, then click on the new HVM cluster). View cluster performance and resource usage (Summary and Monitoring tabs), drill into individual hosts (Hosts tab), see individual workloads (VMs tab), and more.

Subtopics

- Moving Workloads Between Hosts
- Adding hosts
- Maintenance Mode
- Affinity Groups
- Failover
- Adding an NFS Datastore

Moving Workloads Between Hosts

To manually move workloads between hosts, drill into the detail page for the VM (from the VMs tab of the cluster detail page). Click ACTIONS and select “Manage Placement”. Choose a different host and select from the following placement strategies:

- **Auto:** Manages VM placement based on load
- **Failover:** Moves VMs only when failover is necessary
- **Pinned:** Will not move this workload from the selected host

Within a short time, the workload is moved to the new host.

Adding hosts

The process of adding hosts to a pre-existing cluster is very similar to the process of provisioning the cluster initially. The requirements for the new worker node will be identical to the nodes initially added when the cluster was first provisioned. See the earlier sections in this guide for additional details on configuring the worker nodes.

To add the host, begin from the Cluster detail page (selected from the list at Infrastructure > Clusters). From the Cluster detail page, click ACTIONS and select “Add Worker”. Configurations required are the same as those given when the cluster was first created. Refer to the section above on “Provisioning the Cluster” for a detailed description of each configuration.

Once VM Essentials has completed its configuration scripts and joined the new worker node to the cluster, it will appear in a ready state within the Hosts tab of the Cluster detail page. When provisioning workloads to this Cluster in the future, the new node will be selectable as a target host for new Instances. It will also be an available target for managing placement of existing VMs running on the cluster.

NOTE

It’s useful to confirm all scripts related to creating the new host and joining the new host to the cluster completed successfully. To confirm, navigate to the detail page for the new host (Infrastructure > Clusters > Selected Cluster > HostsTab > SelectedHost) and click on the History tab. Confirm all scripts, even those run on the pre-existing hosts, completed successfully as it’s possible the new host was added successfully (green status) but failed in joining the cluster. When such a situation occurs it may appear adding the new host was successful though it will not be possible to provision workloads onto it due to not joining the cluster successfully.

Maintenance Mode

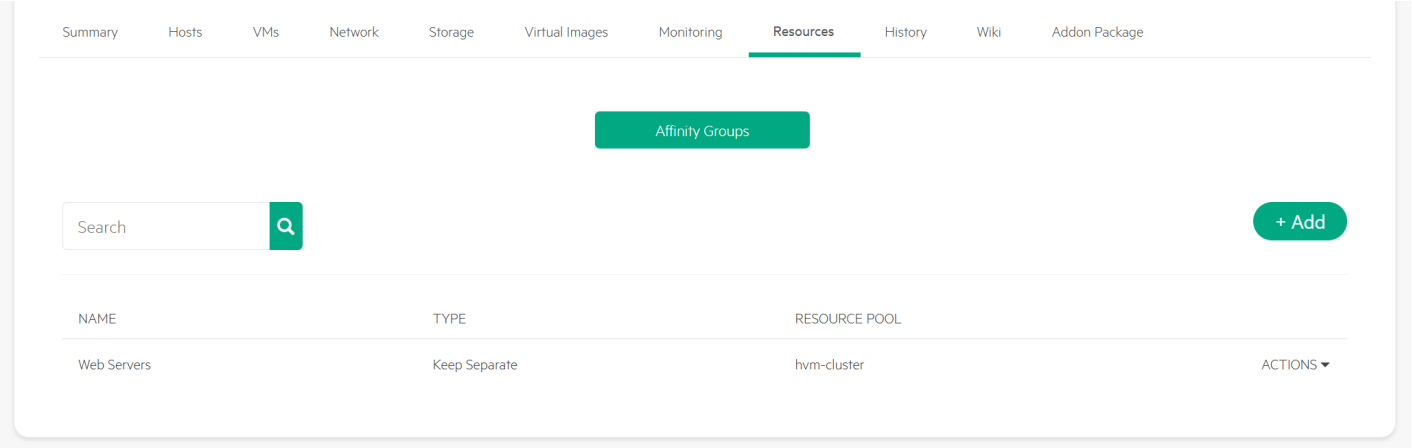
HVM hosts can be easily taken out of service for maintenance when needed. From the host detail page, click ACTIONS and then click “Enter Maintenance.” When entering maintenance mode, the host will be removed from the pool. Live VMs that can be migrated will be moved to new hosts. VMs that are powered off will also be moved when possible. When a live VM cannot be moved (such as if it’s “pinned” to the host), the host will not go into maintenance mode until that situation is cleared. You could manually move a VM to a new host or you could power it down if it’s non-essential. After taking that action, attempt to put the host into maintenance mode once again. VM Essentials UI provides a helpful dialog which shows you which VMs live on the host are to be moved as the host goes into maintenance mode. When maintenance has finished, go back to the ACTIONS menu and select “Leave Maintenance.”

Affinity Groups

HVM Clusters offer affinity groups and anti-affinity groups. These work similarly to affinity groups on other platforms, such as the affinity rules concept in VMware vSphere. An affinity group contains a type (either Keep Together or Keep Separate) and a list of servers which should have the rule applied. Whenever possible, servers configured to "Keep Together" will run on the same HVM Host. Servers configured to "Keep Separate" will be balanced across HVM Hosts to the maximum extent possible.

Viewing Affinity Groups

Affinity groups are listed on the Resources tab of the HVM Cluster detail page (Infrastructure > Clusters, then select the appropriate HVM Cluster). From the ACTIONS menu for each affinity group, they may be edited or deleted. By editing an affinity group, users may view or edit its enabled status (affinity groups which are not enabled will not be acted on).



Adding Affinity Groups

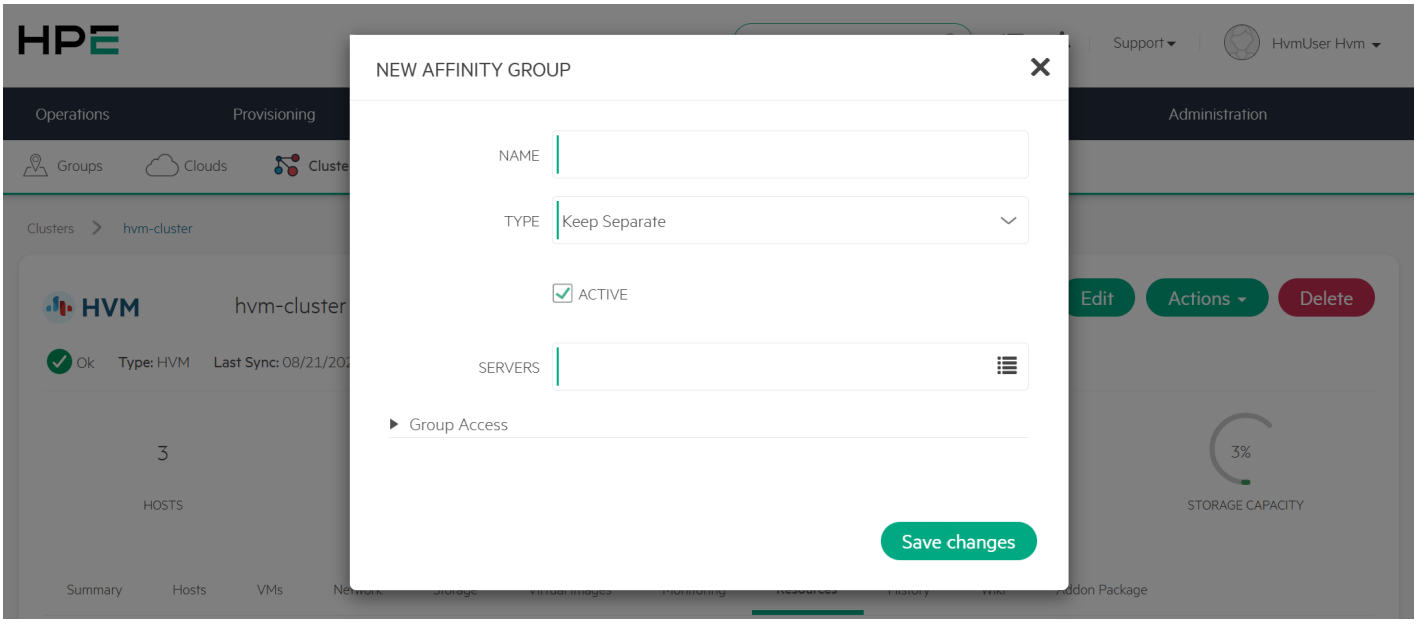
As mentioned in the previous section, affinity groups are listed on the Resources tab of the HVM Cluster detail page (Infrastructure > Clusters, then select the appropriate HVM Cluster). From here, to create a new affinity group, click + ADD. Configure the following:

- **NAME:** A name for the affinity group
- **TYPE:** Select either "Keep Together" or "Keep Separate" to indicate whether the selected servers should run on as few or as many servers as possible within the capabilities of the HVM Cluster
- **ACTIVE:** When checked, the rules defined in the affinity group will be applied to the HVM Cluster
- **SERVERS:** Select as many servers as desired from the typeahead list

Once finished, click SAVE CHANGES. Following the next cluster sync, the affinity rule will be applied and VMs will begin to migrate (if applicable).

TIP

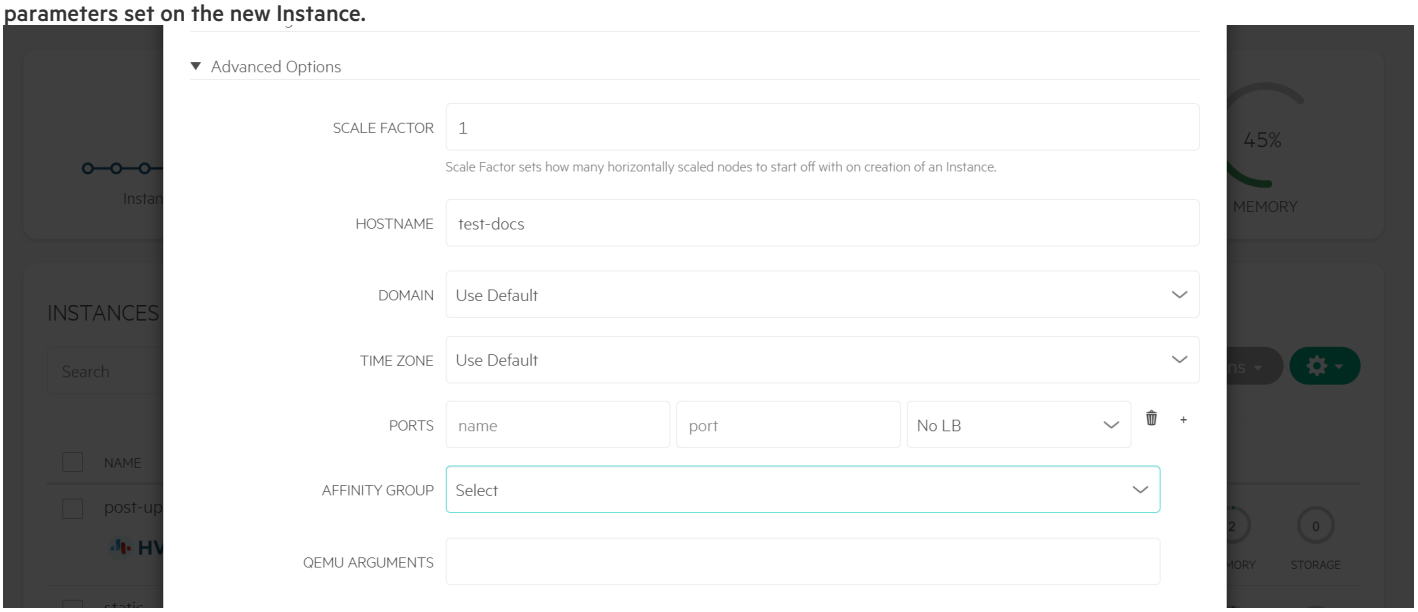
Placement settings (ex. pinning a VM to a specific host) can override an affinity group. HVM Clusters will attempt to implement affinity groups intelligently to work around VM placement. For example, in a group of five VMs configured to "keep together" with one pinned to host 1, the Cluster would run all five VMs on host 1 (if possible) to simultaneously honor the placement and the affinity group. In some scenarios, it will not be possible to simultaneously honor all placements and affinities/anti-affinities.



Adding Servers to Affinity Groups at Provision Time

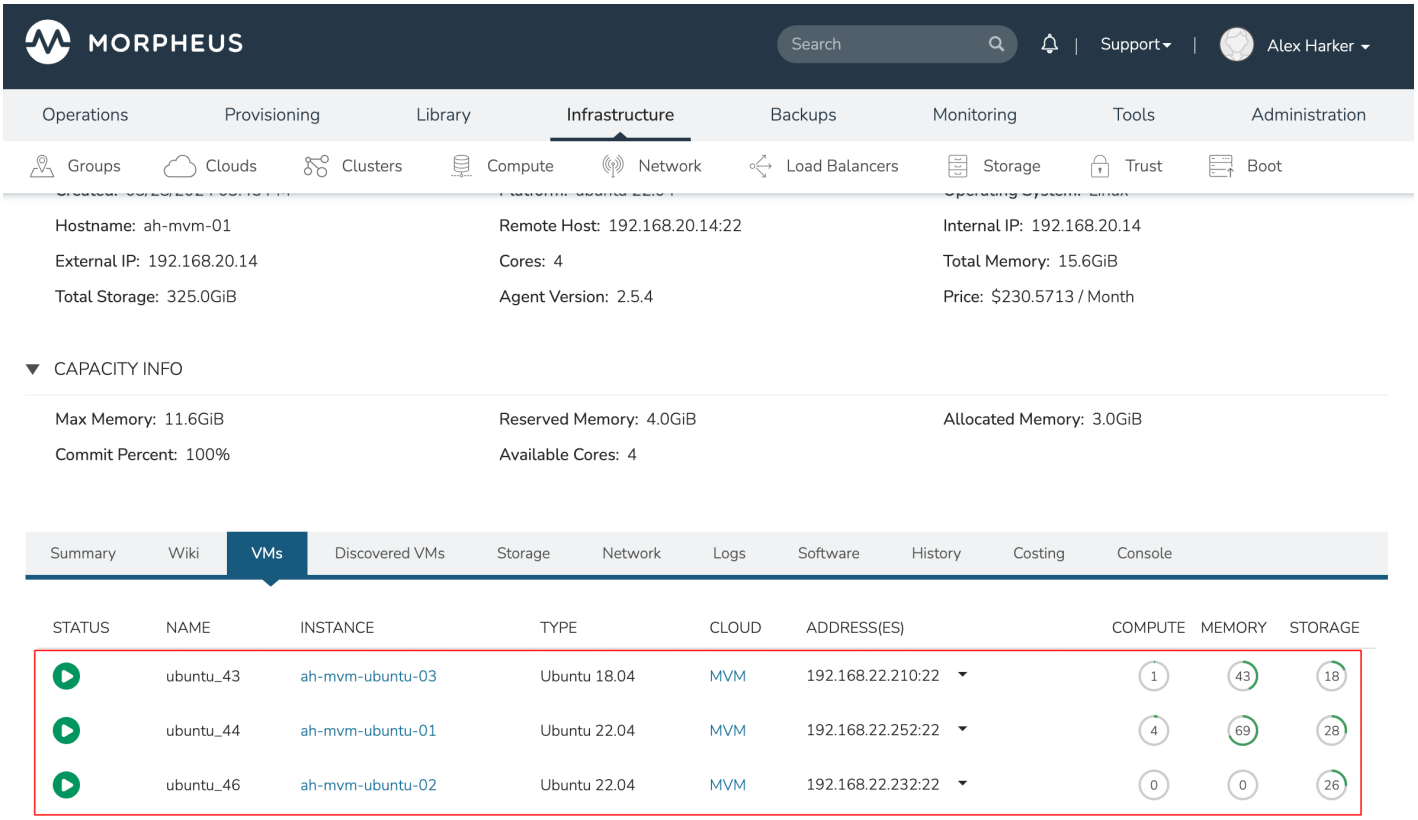
In addition the adding servers from the affinity group, newly-provisioned servers may be added to an affinity group at provision time. From the CONFIGURE tab of the provisioning wizard, expand the Advanced Options section. Within Advanced Options, select an affinity group. The affinity group must be pre-existing and this list will be filtered to show only affinity groups that apply depending on other configuration

parameters set on the new Instance.

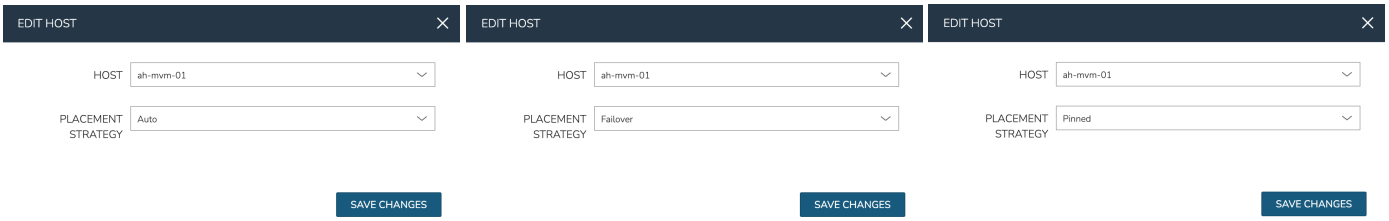


Failover

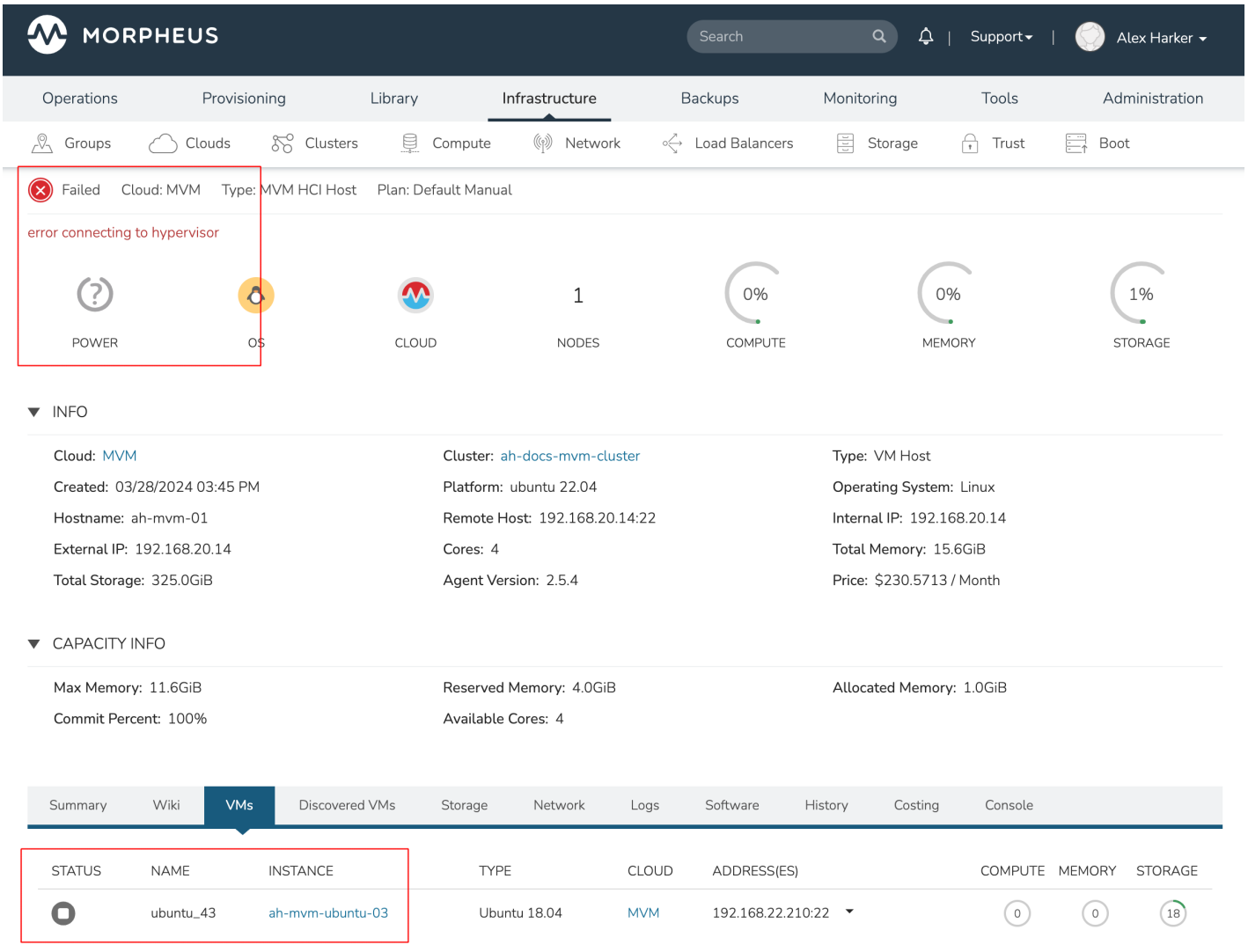
HVM clusters support automatic failover of running workloads in the event of the loss of a host. Administrators can control the failover behavior through the “Manage Placement” action on any running VM. From the VM detail page, click ACTIONS and select “Manage Placement”. Any VM with a placement strategy of “Auto” or “Failover” will be eligible for an automatic move in the event its host is lost. When the loss of a host does occur, the workload will be up and running from a different cluster host within just a short time if it’s configured to be moved during an automatic failover event. Any VMs pinned to a lost host will not be moved and will not be accessible if the host is lost. When the host is restored, those VMs will be in a stopped state and may be restarted if needed.

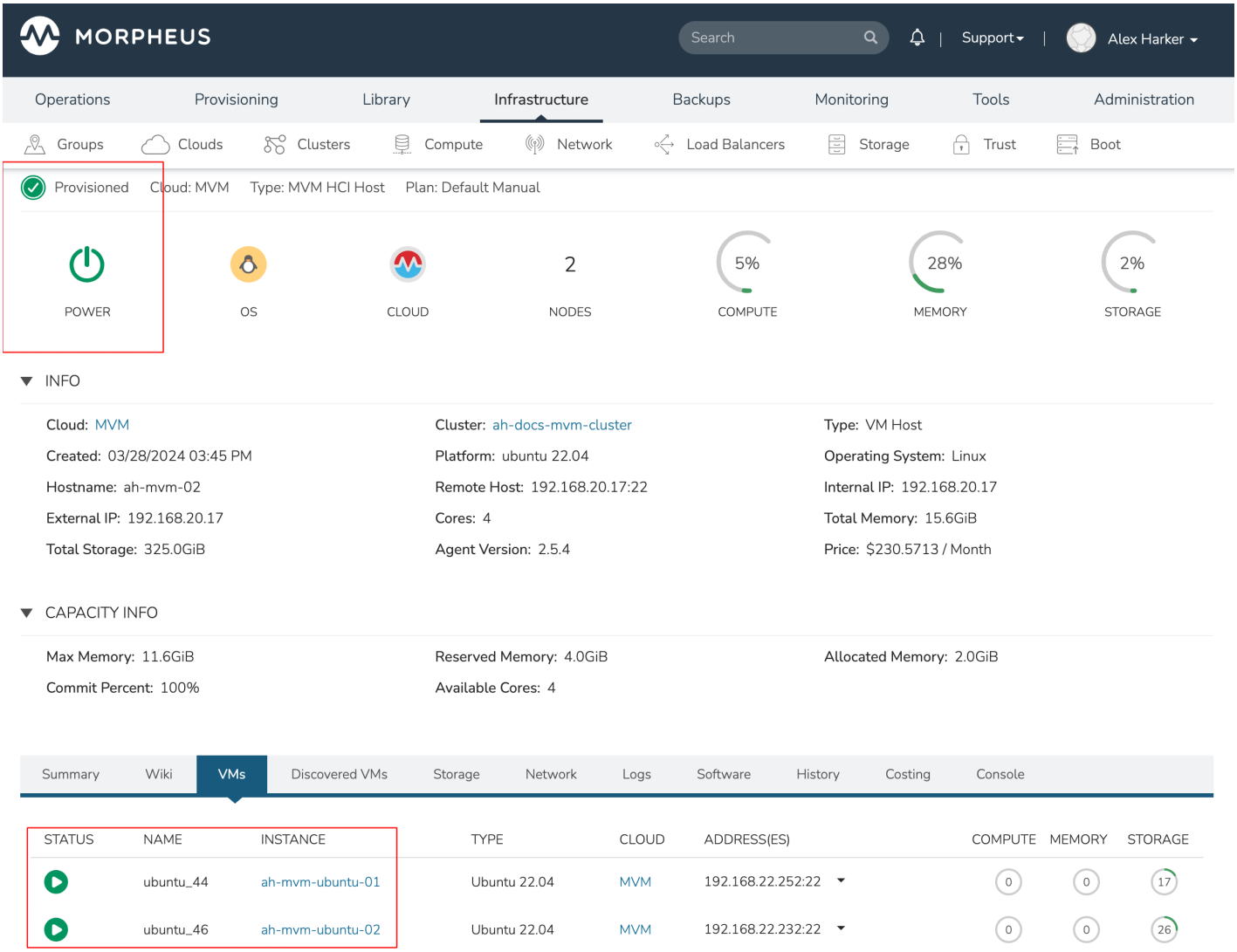


Each of these VMs is configured for a different failover strategy. When the host is lost, we should expect to see the first two VMs moved to an available host (since they have the “Auto” and “Failover” placement strategies, respectively). We should not see the third VM moved.



After loss of the host these three VMs were running on, we can see the lost host still has one associated VM in a stopped state. The other two VMs are running on a second host which is still available.





When the lost host returns, the moved VMs will come back to their original host. The third VM is associated with this host as well and is in a stopped state until it is manually restarted.

Adding an NFS Datastore

Existing NFS shares can be used with HVM clusters for virtual machine storage. These are added and viewed from the Storage tab of the cluster detail page and, once added and active, become selectable as targets for virtual machine storage.

NOTE

Ensure NFS is properly configured to allow all of the HVM hosts to access the shared directory, including permissions to read and write. For backup purposes, it's also helpful to give VM Essentials access to NFS.

Start by navigating to the Storage tab of the cluster detail page. Make sure the Data Stores subtab is also selected. Here you will see a list of existing datastores with some additional information, such as type, capacity, and status. Click ADD. Enter the NAME for the datastore in VM Essentials and select the TYPE as NFS Pool. Note that the datastore name cannot be changed once it has been created. This will update the available fields to include the additional fields needed to integrate the NFS server. Enter the SOURCE HOST which is the hostname or the IP address of the NFS server. Finally, enter the SOURCE DIRECTORY which is the directory path of the NFS share. Click SAVE.

Once the modal is saved, it will take a few minutes to initialize the new datastore and show a successful online status in VM Essentials. Once this initialization process is completed, the datastore can now be used as VM storage for cluster.

Image Prep (Windows)

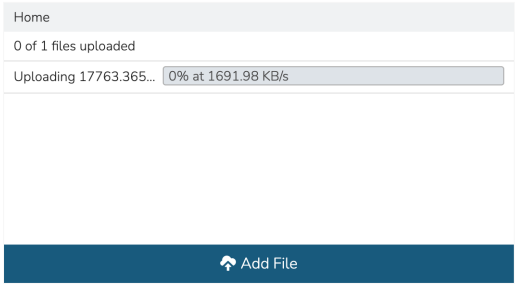
This section will go through the steps to prepare a Windows image which can be successfully provisioned to HVM clusters. Additionally, this image can serve as a template from which additional images and VM Essentials Library items can be built. In this example case, we'll start from downloading a Windows Server 2019 ISO directly from the Microsoft download center and go all the way through to creating a new Instance Type in VM Essentials that users can provision on-demand.

With the Windows ISO already downloaded, begin by uploading the ISO as a Virtual Image in VM Essentials. Virtual Images are added in Library > Virtual Images. Click + ADD and then choose "ISO." Before adding the file itself, set the following configurations on the Virtual Image:

- **NAME:** A name for the Virtual Image in VM Essentials, such as "Windows Server 2019 ISO"
- **OPERATING SYSTEM:** "windows server 2019"
- **MINIMUM MEMORY:** Filters out Service Plans at provision time which do not meet the minimum value. For this image type, I've set 4 GB

In addition to the above, there are a number of checkbox configurations here (many of them are in the expandable "Advanced" section), some of which are checked by default. They should all be unchecked except for "VIRTIO DRIVERS LOADED?" within the "Advanced" expandable section.

With the configurations set, it's time to upload the ISO to VM Essentials. Keep in mind that if you do not specify a bucket in which the file should be uploaded, it will be uploaded to the appliance itself. If you choose to do this, be sure you have enough space to store the images you need. Within the UPLOAD VIRTUAL IMAGE modal is a large dropzone labeled "Drop Files Here." You can drag and drop the ISO file here or you can click the button labeled "Add File" and browse for it. A progress bar will appear, wait until the file is completely uploaded before you save and dismiss the modal. After the file has completely uploaded, click SAVE CHANGES.

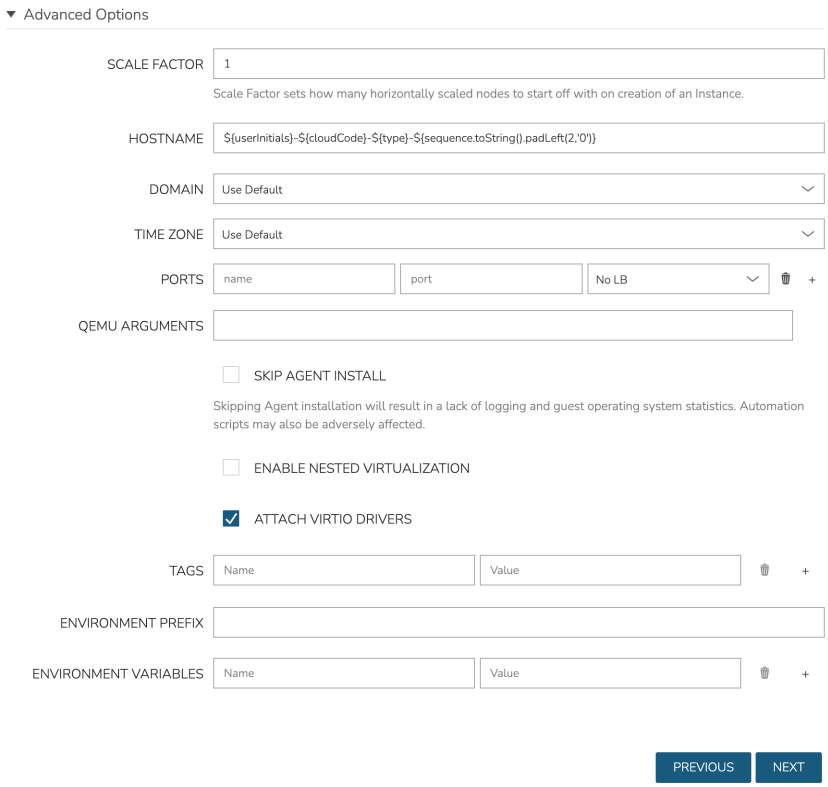


Next, we'll provision a VM from the ISO using the built-in HVM Instance Type. Once running, we will configure the VM to any specific requirements and convert it to a template. Navigate to Provisioning > Instances and click + ADD. On the TYPE tab of the Instance provisioning wizard, we select the Instance Type to provision. In this case, select "HVM" and click NEXT.

On the GROUP tab, select the Group and Cloud containing the target MVM Cluster and provide a name for the new Instance. In my case, I have an automatic naming policy setting my Instance name, but depending on your appliance configuration you may need to enter a custom name. Click NEXT.

On the CONFIGURE tab, first select the IMAGE. Select the Windows server ISO that was uploaded in the previous step. Based on the minimum memory configuration that was set on the Virtual Image, Plans which are too small will be filtered out. Among compatible Plans, select one that meets your requirements. Next, set the RESOURCE POOL, which is the HVM cluster you're targeting. Configure disks and disk sizes, as well as network details (this will vary based on HVM cluster configuration). Finally, select the HOST, which is the HVM host within the cluster that the new Instance should initially be provisioned onto.

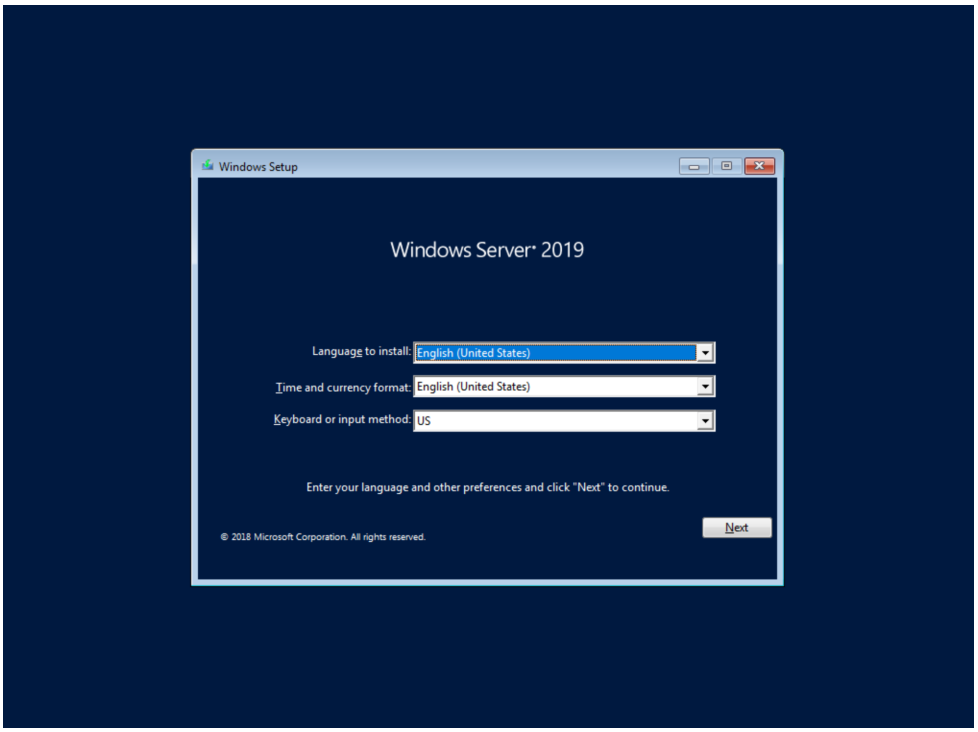
As a final step, we need to also expand the "Advanced Options" section and make sure "ATTACH VIRTIO DRIVERS" is checked. This will attach an ISO containing the VirtIO drivers which we'll use later. Click NEXT.



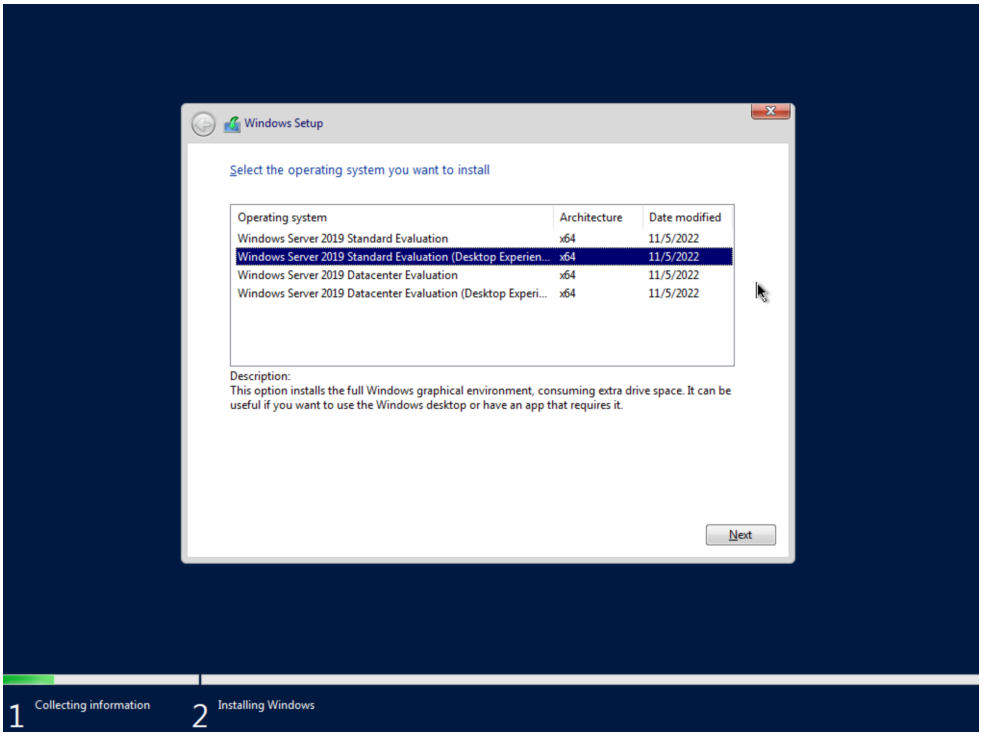
The final two tabs of the wizard, AUTOMATION and REVIEW, do not require any configuration changes though you may want to review the Instance settings on the final tab. When done, click COMPLETE.

Click on the newly provisioning Instance from the Instances list page. Since this image is being provisioned for the first time, the image must be uploaded to the HVM host. This can take a little bit of time but any future attempts to provision workloads from this image will skip this step. Wait for the Instance to fully complete and appear in a green “Ready” status.

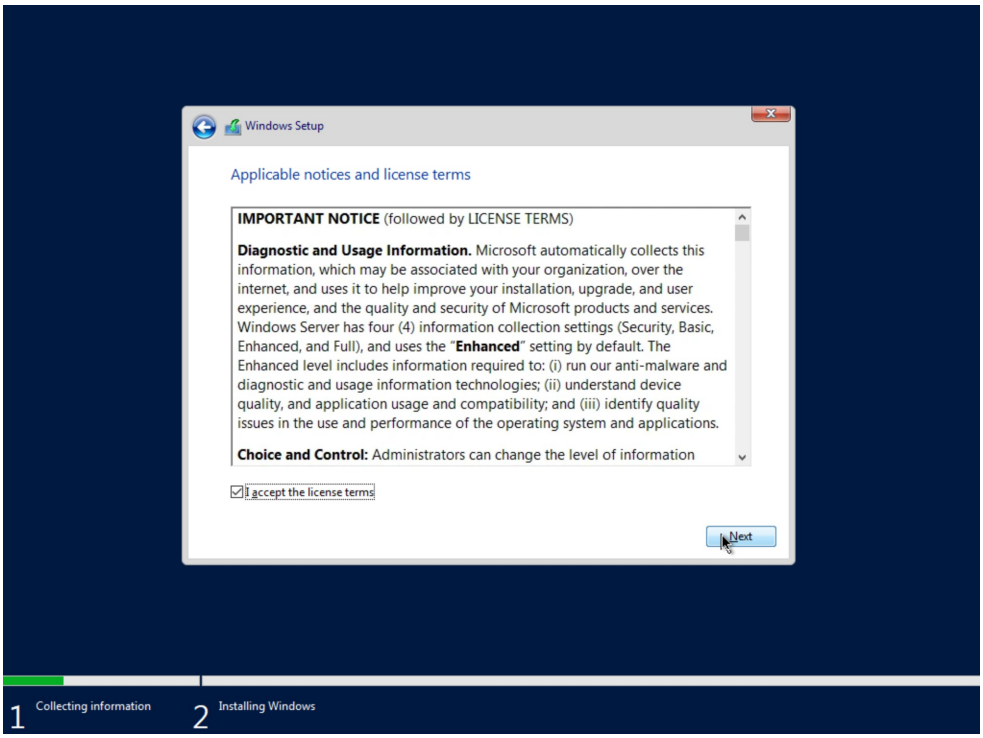
Once the Instance has fully finished provisioning, launch a console session by clicking ACTIONS and then “Open Console.” This will open a new window with a console session into the VM.


Windows Setup
Windows Server 2019
Language to install: English (United States)
Time and currency format: English (United States)
Keyboard or input method: US
Enter your language and other preferences and click "Next" to continue.
© 2018 Microsoft Corporation. All rights reserved.
Next

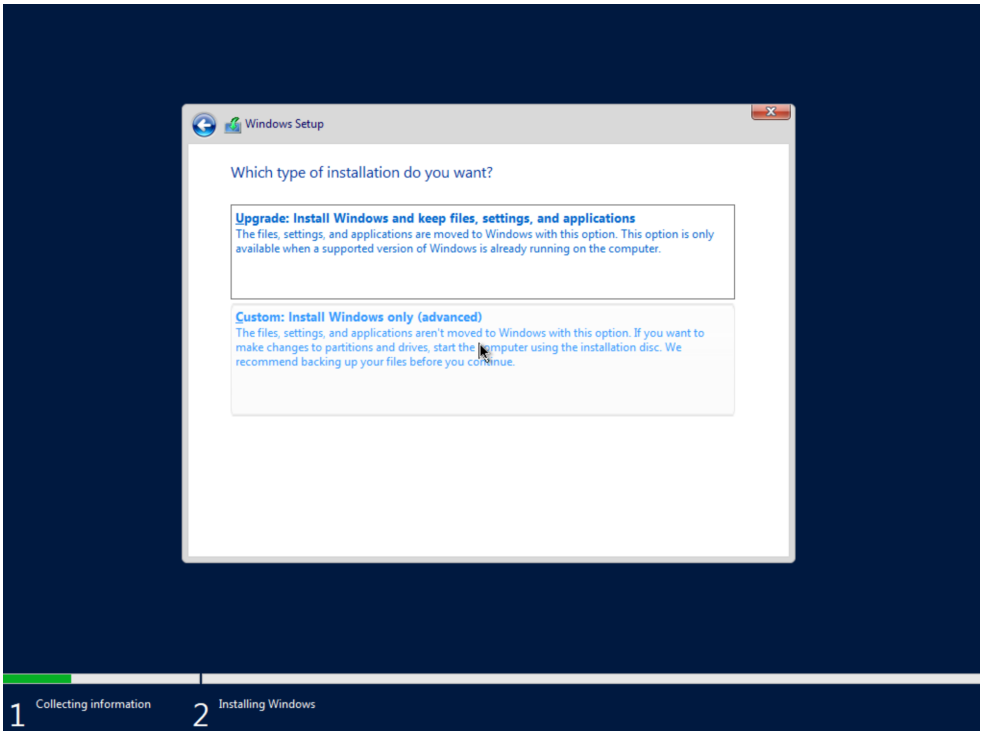
After selecting the language, click “Next.” On the following screen, click “Install Now.” This will begin the Windows setup process on our new VM. You’ll next select the operating system type you wish to install. For this example, I’m installing 2019 standard with desktop experience. Click “Next.”



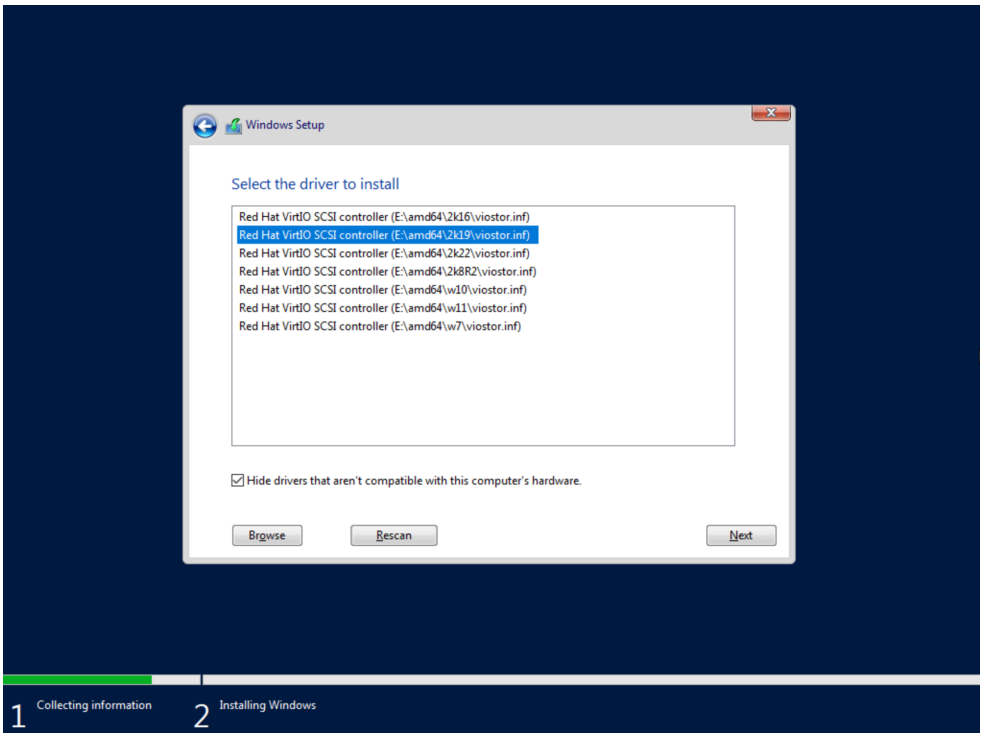
Accept the licensing terms and click “Next.”


Windows Setup
Applicable notices and license terms
IMPORTANT NOTICE (followed by LICENSE TERMS)
Diagnostic and Usage Information. Microsoft automatically collects this information, which may be associated with your organization, over the internet, and uses it to help improve your installation, upgrade, and user experience, and the quality and security of Microsoft products and services. Windows Server has four (4) information collection settings (Security, Basic, Enhanced, and Full), and uses the "Enhanced" setting by default. The Enhanced level includes information required to: (i) run our anti-malware and diagnostic and usage information technologies; (ii) understand device quality, and application usage and compatibility; and (iii) identify quality issues in the use and performance of the operating system and applications.
Choice and Control: Administrators can change the level of information
I accept the license terms
Next
1 Collecting information
2 Installing Windows

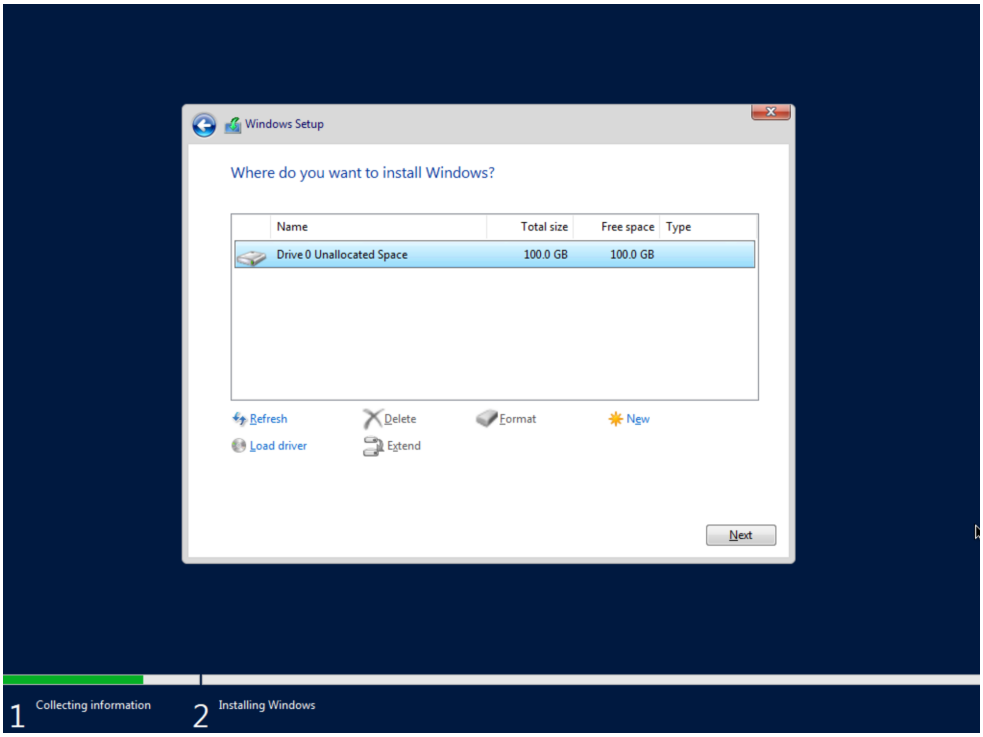
On the next screen, choose a custom install.


Windows Setup
Which type of installation do you want?
Upgrade: Install Windows and keep files, settings, and applications
The files, settings, and applications are moved to Windows with this option. This option is only available when a supported version of Windows is already running on the computer.
Custom: Install Windows only (advanced)
The files, settings, and applications aren't moved to Windows with this option. If you want to make changes to partitions and drives, start the computer using the installation disc. We recommend backing up your files before you continue.
1 Collecting information
2 Installing Windows

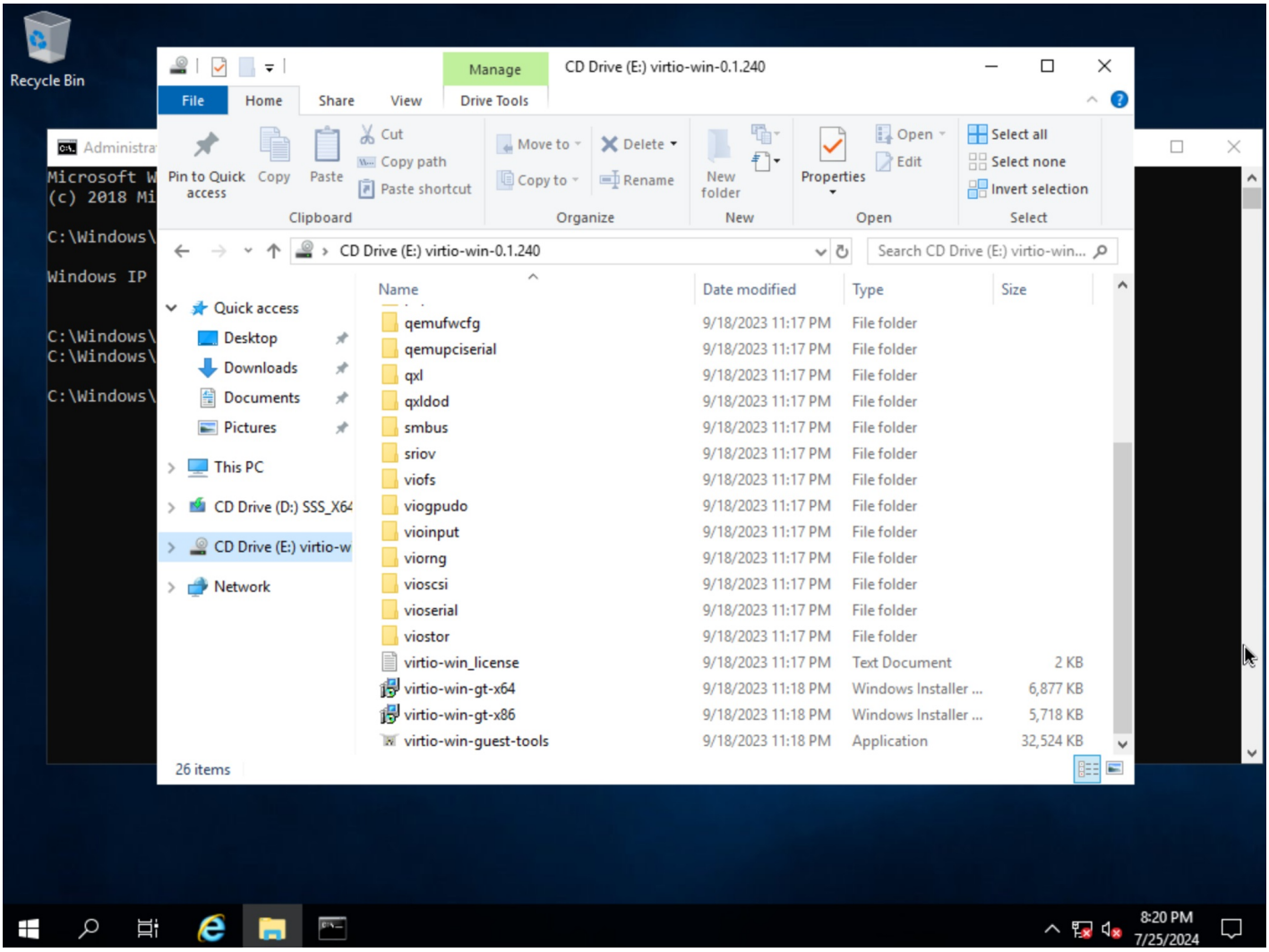
The next screen asks where Windows should be installed and may be empty. Click “Load Driver” to locate the mounted disk image containing the VirtIO drivers. The search should return a number of VirtIO SCSI controller packages for various Windows flavors. Select the proper package for the Windows version being installed. Click “Next.”


Windows Setup
Select the driver to install
Red Hat VirtIO SCSI controller (E:\amd64\2k16\viostor.inf)
Red Hat VirtIO SCSI controller (E:\amd64\2k19\viostor.inf)
Red Hat VirtIO SCSI controller (E:\amd64\2k22\viostor.inf)
Red Hat VirtIO SCSI controller (E:\amd64\2k8R2\viostor.inf)
Red Hat VirtIO SCSI controller (E:\amd64\w10\viostor.inf)
Red Hat VirtIO SCSI controller (E:\amd64\w11\viostor.inf)
Red Hat VirtIO SCSI controller (E:\amd64\w7\viostor.inf)
Hide drivers that aren't compatible with this computer's hardware.
Browse
Rescan
Next
1 Collecting information
2 Installing Windows

After a moment, we’re back at the screen asking where Windows should be installed. We should see the disk(s) of size and type selected at the time the VM was provisioned. Select the proper disk and click “Next.” The Windows installation will now begin. Once Windows has fully installed, proceed to the next step.

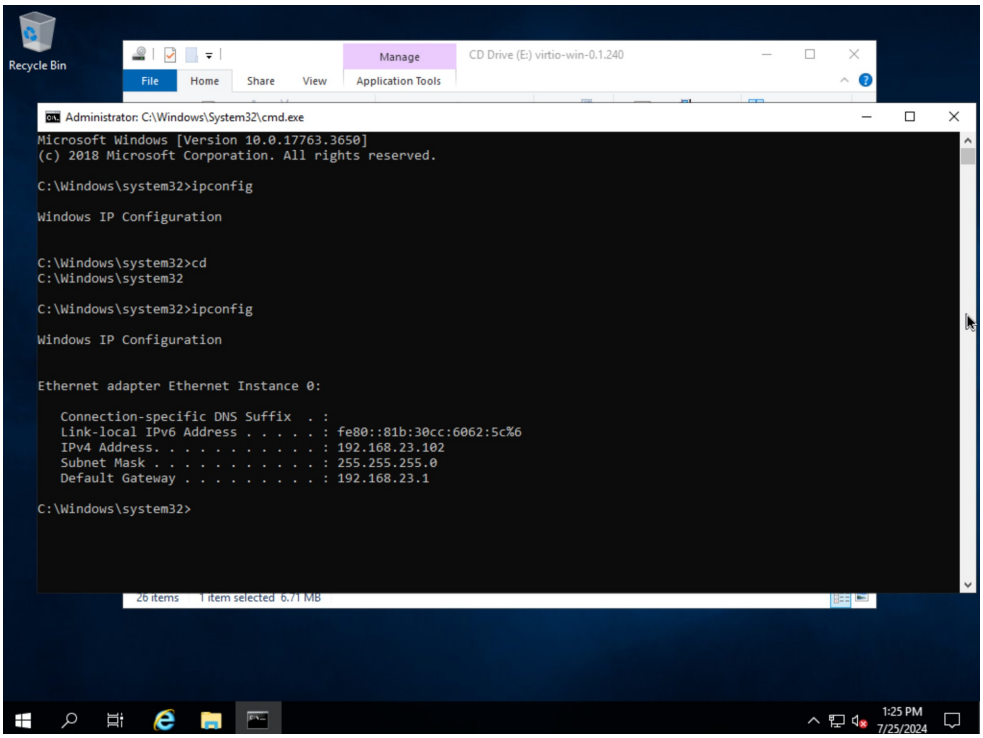


Following installation, Windows will restart and prompt for an Administrator user password. Set the password and log in as Administrator. Currently, there are no network interfaces configured. We need to install the VirtIO drivers to get this machine onto the network. We have a disk image mounted with the driver installer so we need to navigate to that drive and launch the installer. Open Windows Explorer and locate the drive in the side bar. In my case, it's the E: drive. Right-click on `virtio-win-guest-tools` and select "Install."

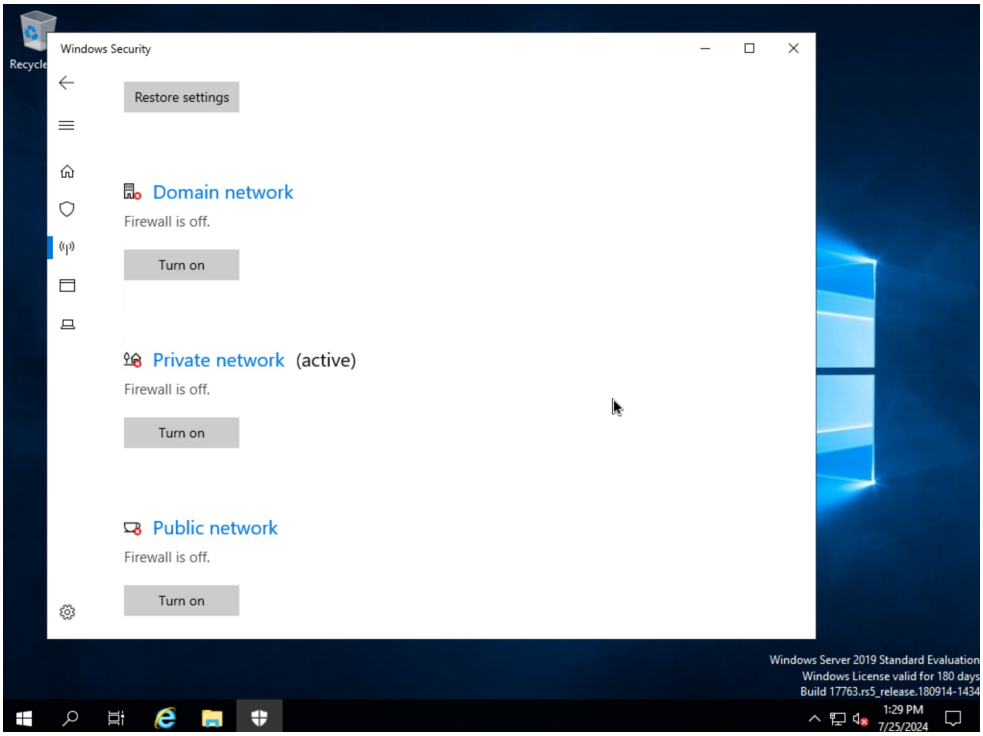


Step through the installer. Simply click "Next" or "Install" through each step, there are no configuration changes needed. Once the installer

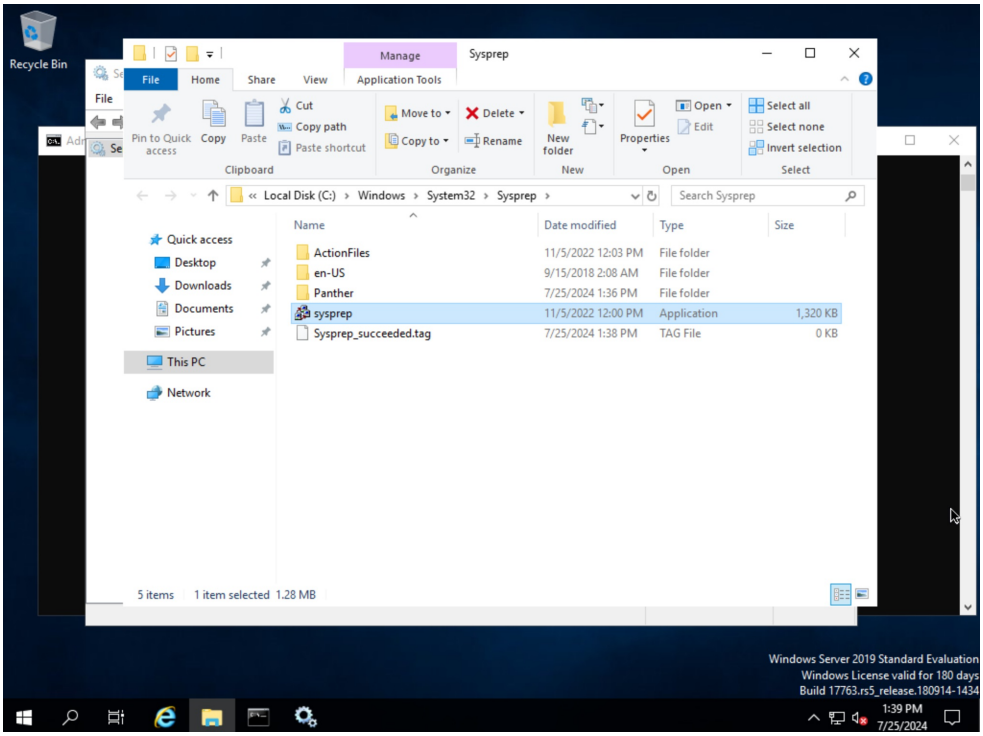
has completed, click “Finish.” You can confirm we now have a network interface by opening a Command Prompt session and using the `ipconfig` command. One network adapter should be listed.



We can now eject the two virtual disks, drives D: and E: in my case. Then, launch Windows Security so we can disable firewalls. Turn off firewall for domain, private network, and public network.



Next, back in Command Prompt, run `winrm quickconfig` to configure `winrm`. Within `Services`, ensure that `winrm` (Windows Remote Management) is set to automatic on startup. Right-click on the Start button and select Run. Enter “sysprep” and click OK. In the Windows Explorer window that appears, right-click on `sysprep` and click “Run as Administrator”. Under “Shutdown Options”, choose Quit and click OK. If this is set to shutdown, VM Essentials will simply restart the VM. Once this is completed, a new file `Sysprep_succeeded.tag` appears in Windows Explorer.



We're now done configuring Windows and the console window can be closed. We'll move on to creating a template from the VM we just configured. Begin by opening an SSH session into the VM Essentials appliance server. Confirm `jq` is up to date on the appliance box (`apt install jq`). Then, go ahead and stop the running Windows VM. We can do this from the Instance detail page in VM Essentials. Click ACTIONS and then "Stop Server." Still on the Instance detail page, click ACTIONS and then "Import as Image." This will perform a snapshot and create a new Virtual Image (Library > Virtual Images).

The Virtual Image is not usable until it's in an active status and the UI indication may display an active status even before it's fully ready. If it's "SAVING" or "QUEUED," it is still being prepared and saved. To determine the current status of the Virtual Image, check with a call to VM Essentials API like the one below. When the return output lists a status of "Active," the image is ready to be provisioned from.

```
curl -k --request GET --url https://xx.xx.xx.xx/api/virtual-images/<id>
--header 'accept: application/json' --header 'authorization: Bearer xxx-xxx-xxx-xxx-
xxx' |
jq '.virtualImage.status'
```

Once saved, additional configurations are needed on the Virtual Image in VM Essentials. Edit the new Virtual Image and check the following configurations:

- **MINIMUM MEMORY:** Set as appropriate
- **SYSPREPPED/GENERALIZED IMAGE?:** Checked
- **INSTALL AGENT?:** Checked
- **USERNAME:** Remove if present
- **PASSWORD:** Remove if present
- **VIRTIO DRIVERS LOADED?:** Checked

All other checkbox-type configurations not mentioned in the above list should be unchecked. Click SAVE CHANGES.

At this point all image preparation steps are completed. Repeat the process of provisioning an HVM Instance Type selecting the new image in the future when needed.

Utilizing Existing QCOW Images from an NFS File Share

Integrated NFS shares can be used both as a repository for HVM cluster images and as a target for saving new images from existing VMs. This offers benefits of greatly expanding the available storage compared to what's available on the VM Essentials manager VM, insulates you from issues that can arise from images completely filling the manager storage, and allows for the same images to be easily integrated

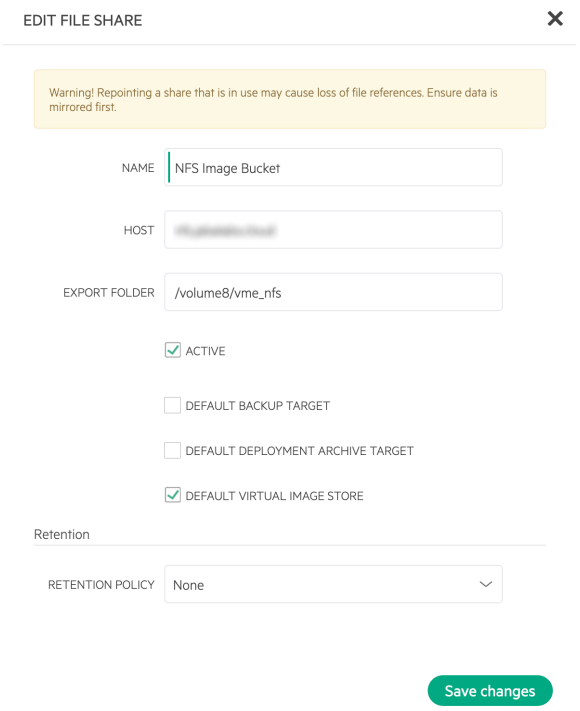
with multiple VM Essentials appliances.

To begin, we need the NFS file share integrated with VM Essentials. This is done in the Infrastructure > Storage section of the UI. This guide assumes the NFS file share is pre-existing and the VM Essentials manager can reach it. Actually setting up an NFS file share goes beyond the scope of this guide. From the File Shares tab, check to see the desired file share is already integrated. If needed, you can add one by clicking + ADD and then selecting “NFSv3”.

When adding a new file share, configure the following:

- **NAME:** A friendly name for the file share within VM Essentials
- **HOST:** The IP address or hostname for the NFS file share server
- **EXPORT FOLDER:** The path to the folder that should be mounted to the manager
- **ACTIVE:** Must be checked to be able to consume this file share elsewhere in VM Essentials manager UI
- **DEFAULT VIRTUAL IMAGE STORE:** (Optional) Select if you wish this file share to be the default store for newly uploaded or generated images

When done, click Save changes.



IMPORTANT

You must configure the NFS share to give VM Essentials manager read and write access if you want to be able to read images from and write images to the file share. Configuring NFS file shares goes beyond the scope of this guide. Deleting files from an integrated file share deletes the actual file and not just the representation of the file in VM Essentials. This includes Virtual Images. Deleting a Virtual Image that is backed by a QCOW image file stored in an integrated file share will also cause the file itself to be deleted in addition to the Virtual Image object within VM Essentials.

With the file share integrated, we can now create Virtual Images which are backed by QCOW images that are pre-existing in the file share. Navigate to Library > Virtual Images and click + ADD. From the dropdown, select “QCOW2”. Make the configurations specified below. Those not mentioned can often be left on the default value. For a deeper explanation of configurations not mentioned here, see the dedicated section of VM Essentials documentation on Virtual Images.

- **NAME:** A friendly name for the image in VM Essentials
- **OPERATING SYSTEM:** Specify the operating system of the image
- **MINIMUM MEMORY:** Enter a minimum memory value and VM Essentials will not allow the image to be provisioned using a plan with lower memory

- **BUCKET:** Select the NFS share integrated in the previous step
- **CREATE IMAGE ID:** Set to “URL/PATH”
- **URL:** Enter the path to the QCOW image within the file share. See the next paragraph for a deeper explanation of how to enter the path properly

The entered path to the QCOW image should not include the name of the NFS share or the name of the file itself. See the portion highlighted in the screenshot:

It also should only be the path to the folder containing the QCOW image. The file name itself should not be part of the path. For example, `templates/qcow/ubuntu/server/2204/011025`. Click Save changes.

With the NFS file share integrated and the Virtual Image created, the image is now usable from the provisioning wizard. This guide won’t fully cover the use of the provisioning wizard but from the Configure tab of the wizard, the image is now selectable (assuming you’ve selected a compatible provisioning target). Additionally, we can now click into the detail page for running Instances and save them to images backed by the NFS file share. From the Instance detail page, click Actions, then “Import as Image.” You’ll be able to set a name for the new image and specify the NFS file share as the target bucket.

Hardware Passthrough

HPE Morpheus VM Essentials includes hardware passthrough and pooling support for VMs provisioned to HVM Clusters. This support extends to GPU, USB and NVME devices. In order to be usable, such devices must be attached to a HVM Host or to multiple HVM Hosts. HPE Morpheus VM Essentials includes controls to detach hardware devices from the underlying OS on the hypervisor host and add them to a pool where they are available for consumption by VMs. GPU hardware can be attached to VMs at provision time through custom Service Plans or on an ad-hoc basis by manually attaching hardware to existing VMs. Other supported hardware types must be passed through to the VM after provisioning.

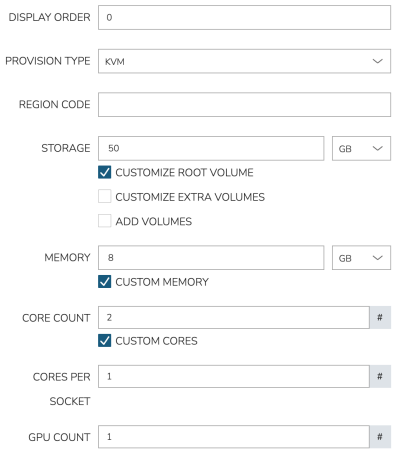
Subtopics

Creating Service Plans
Viewing and Assigning Hardware Devices
GPU Passthrough Example

Creating Service Plans

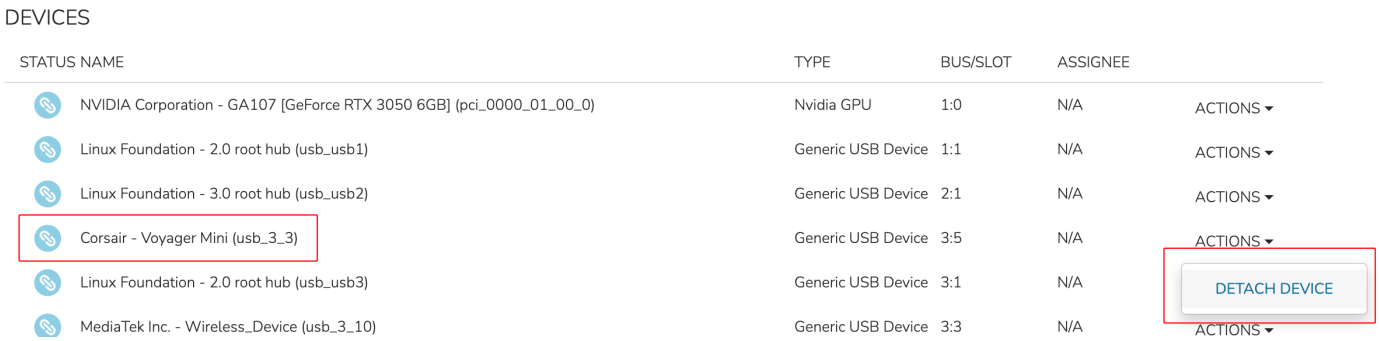
When utilizing GPU hardware, it may be most convenient to use a custom Service Plan. This allows administrators to pre-configure the number of discrete hardware cards to attach to the VM at provision time. Once provisioned, the specified number of GPUs will be attached to the VM. For workloads which are provisioned and torn down regularly, this will save additional steps of manually attaching GPUs available from the pool. On teardown, attached devices of all types are released back to the pool. Though in some cases utilizing Service Plans may be most convenient, as you’ll see in the next sections it is not strictly required. It is also possible to manually attach GPUs or other hardware types on any existing VMs running on the HVM Cluster.

To create a new Service Plan, navigate to Administration > Plans. Click + Add and then Service Plan. In the New Service Plan modal, first set the PROVISION TYPE configuration to “KVM.” This will update the available configuration fields and reveal the GPU COUNT configuration. Use this configuration to set the number of GPU hardware cards which should be attached to provisioned VMs using this Service Plan. All other configuration fields for Service Plans go beyond the scope of this section. When finished, click SAVE CHANGES.

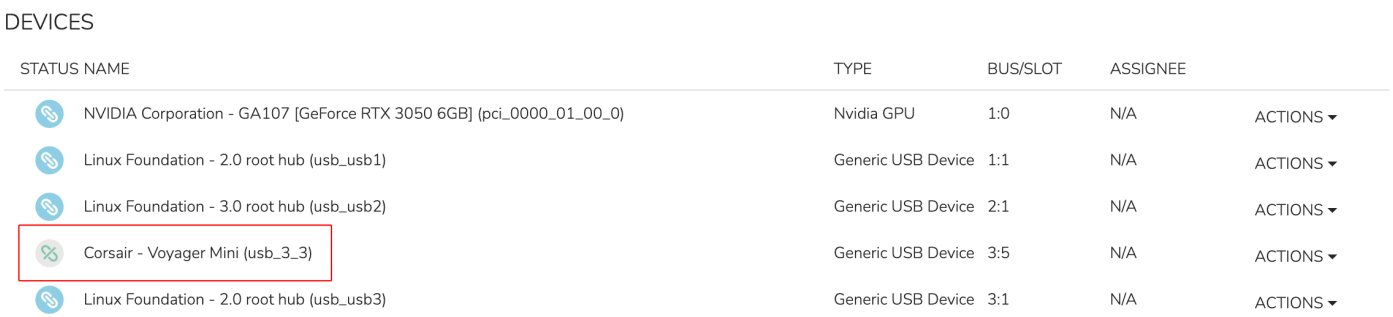


Viewing and Assigning Hardware Devices

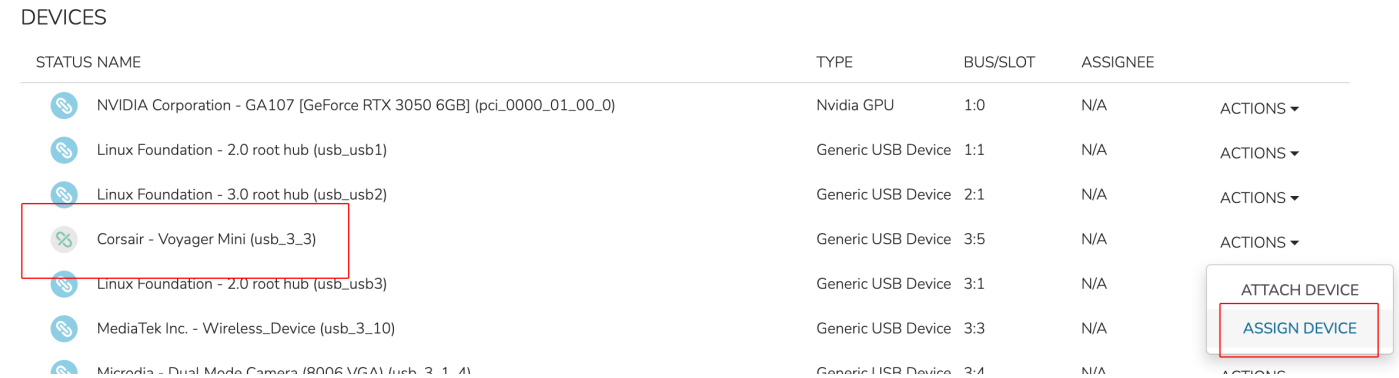
Hardware Devices are surfaced at the Host detail level and the VM (server) detail level through a Devices tab. The Host detail will show all attached hardware devices and their current status: Attached (to the host), detached (from the host), or assigned (to a VM). The VM detail will show only hardware devices currently attached to that VM. To begin consuming hardware devices with HVM Cluster VMs, look again at the list in the Devices tab on the Host detail page. Detach a piece of hardware from the host using the ACTIONS dropdown for that piece of hardware. As shown in the screenshot below, DETACH DEVICE is selected for a USB device.



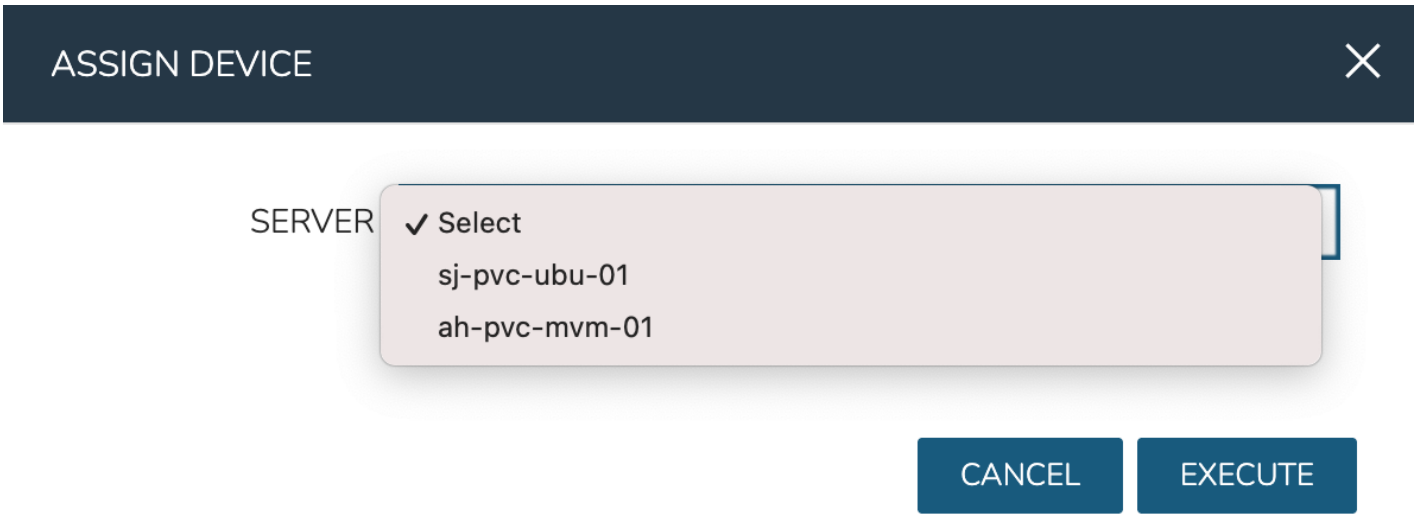
Once detached, the status of the device is changed to “Detached” (see screenshot below) and the device is available for consumption by VMs running on this host.



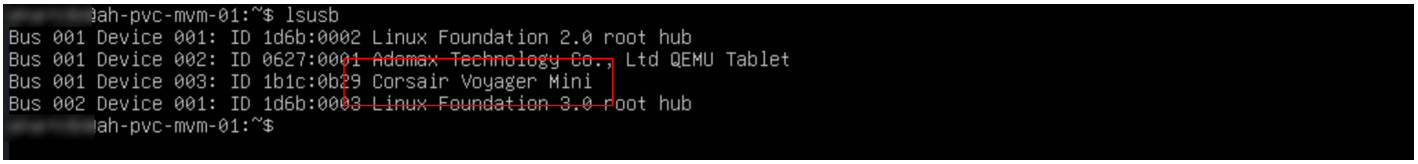
To assign the hardware to a specific VM, click the ACTIONS dropdown once again for the now-detached hardware. Now, click ASSIGN DEVICE.



Within the ASSIGN DEVICE modal that will appear, select the server for device assignment and click EXECUTE.



The icon and status for the device in the hardware list has now changed to "Assigned." If we then open a console session with this VM, we can see the USB device is assigned successfully and is usable by the guest OS.


ah-pvc-mvm-01:~$ lsusb
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
Bus 001 Device 002: ID 0627:0001 Adomax Technology Co., Ltd QEMU Tablet
Bus 001 Device 003: ID 1b1c:0b29 Corsair Voyager Mini
Bus 002 Device 001: ID 1d6b:0003 Linux Foundation 3.0 root hub
ah-pvc-mvm-01:~$

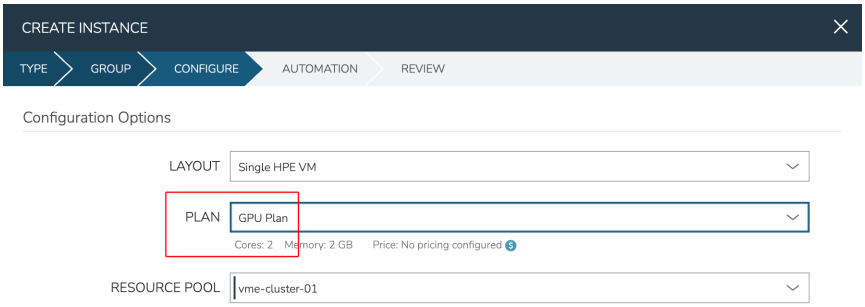
The same process can be used to detach and assign GPU or NVME devices.

GPU Passthrough Example

In a previous section, a Service Plan was created which consumes a GPU when a VM is provisioned using that Plan. This section shows an example provisioning a workload using that Plan and a GPU-accelerated workload running on the VM. In this example, there is an Nvidia GeForce RTX 3050 connected to one of the HVM Hosts. By passing the GPU hardware through to a provisioned VM, hardware-accelerated AI workloads can be run on the VM.

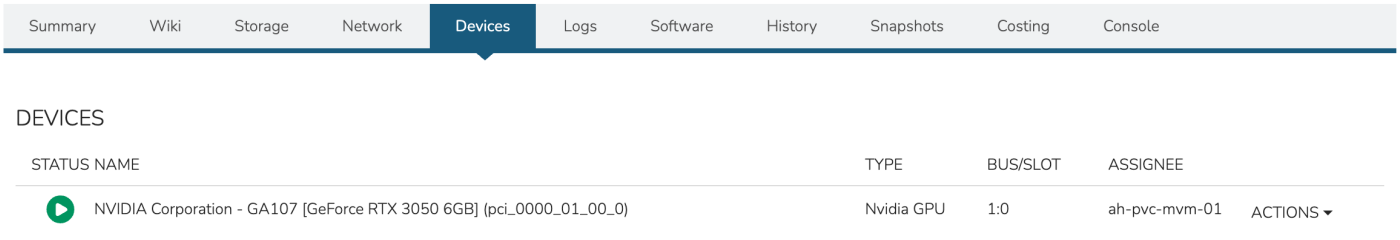
Begin by navigating to Provisioning > Instances. The list of all currently-managed Instances is here along with high level information (power state, etc). To begin a new Instance, click + ADD. Choose type HVM and click NEXT. On the next pane, choose the Group and Cloud in which your desired HVM Cluster resides, name the Instance, and click NEXT.

On the CONFIGURE tab, the main thing to note for this example is the PLAN configuration. This dropdown contains some default Plans that are included with HPE Morpheus VM Essentials and compatible with the HVM provisioning technology (named "1 CPU, 1GB Memory", etc). This dropdown also includes user-created Plans, such as those you've created to consume GPU hardware. In the screenshot below, you can see the "GPU Plan" was selected.



From here, complete the Instance provisioning wizard selecting any automation or lifecycle configurations and wait for the Instance provisioning to complete.

With provisioning complete, check the attached device(s) from the HPE Morpheus VM Essentials UI. This is done from the VM level rather than the Instance level. From the Instance detail page, click on the Resources tab. Click on the name of the desired VM to access the VM detail page. Click on the Devices tab. As in the screenshot below, the attached GPU should be shown.



To go further, open a console session to the new VM either through HPE Morpheus VM Essentials UI or by connecting to the VM over SSH from a local terminal session. Use the `lspci` command to view all devices connected to PCI buses. The attached GPU should be shown here as it is in the UI.

At this point, the VM is ready to run GPU-accelerated workloads normally. To test this, I'll run Ollama which is an open-source tool designed to make it easy to run large language models (LLMs) locally. In the screenshot below, see the AI chatbot response to an input. This result took only a few seconds thanks to GPU hardware acceleration.

```
ahark86@ah-pvc-mvm-01:~$ ollama run llama2
>>> tell me about hpe

Hewlett Packard Enterprise (HPE) is a leading technology company that provides a wide range of products, services, and
solutions to businesses, organizations, and governments around the world. Here are some key things to know about HPE:

1. History: HPE was formed in 2015 as a result of the merger between Hewlett-Packard (HP) and Enterprise Services, a
subsidiary of Dell. The company has a long history dating back to 1939 when William Redington Hewlett and David Packard
founded HP in a small garage in Palo Alto, California.
2. Business segments: HPE operates through two main business segments: Enterprise Group and Technology Services. The
Enterprise Group provides hardware, software, and services to help customers build, manage, and secure their IT
infrastructures. The Technology Services segment offers a range of services, including cloud computing, application
management, and cybersecurity.
3. Products and services: HPE offers a wide range of products and services, including servers, storage devices, networking
equipment, software, and services. Some of its popular products include the ProLiant server, the 3PAR storage array, and
the Aruba networking portfolio.
4. Cloud computing: HPE is a leading provider of cloud computing solutions, offering a range of services and tools to help
customers build and manage their own clouds, as well as consume cloud services from HPE. The company's cloud offerings
include HPE Helion Managed Cloud Services, HPE Helion Cloud Platform, and HPE Helion Development Platform.
5. Artificial intelligence (AI) and machine learning (ML): HPE is a pioneer in the field of AI and ML, with a range of
solutions and services designed to help customers leverage these technologies to improve their business outcomes. The
company's AI and ML offerings include the HPE Ezmeral AI Platform, HPE Machine Learning Studio, and HPE Vertica for AI and
ML workloads.
6. Cybersecurity: HPE is a leading provider of cybersecurity solutions, offering a range of products and services designed
to help customers protect their IT infrastructures from cyber threats. The company's cybersecurity offerings include the
HPE Aruba ClearPass security management platform, the HPE Aruba NetProtect network security solution, and the HPE Fortify
on Demand application security service.
7. Partnerships and collaborations: HPE has a strong track record of forming partnerships and collaborations with other
technology companies to deliver joint solutions and services to customers. Some of its key partners include Microsoft,
Cisco, and SAP.
8. Locations: HPE has operations in over 170 countries around the world, with major locations in North America, Europe,
Asia, and Australia. The company's global headquarters is located in San Jose, California.
9. Employment: HPE employs over 50,000 people worldwide, with a diverse range of roles including engineering, sales,
marketing, and support. The company offers a range of career development opportunities and programs to help employees grow
and succeed.
10. Community involvement: HPE is committed to giving back to the communities where it operates, with a focus on
education, innovation, and social responsibility. The company supports a range of charitable organizations and initiatives
around the world.

>>> Send a message (/? for help)
```

With the request completed, we can run the `ollama ps` command which confirms the model was running under GPU acceleration.